DETERMINANTS OF EFFECTIVE HOUSEHOLD SOLID WASTE MANAGEMENT PRACTICE: THE CASE IN JIMMA TOWN- SOUTHWESTERN ETHIOPIA

BY

NAOL SOBOKSA

JIMMA UNIVERSITY

COLLEGE OF BUSINESS AND ECONOMICS

DEPARTMENT OF MANAGEMENT

MASTERS OF PUBLIC MANAGEMENT (MPM)

JUNE, 2014

JIMMA, ETHIOPIA

DETERMINANTS OF EFFECTIVE HOUSEHOLD SOLID WASTE MANAGEMENT PRACTICE: THE CASE IN JIMMA TOWN-SOUTHWESTERN ETHIOPIA

BY

NAOL SOBOKSA

ADVISORS

Mr. ASHENAFI HAILE (MA): PRINCIPAL ADVISOR

Dr. WENDAFERAW MULUGETA (PhD): CO-ADVISOR

A THESIS SUBMITTED TO SCHOOL OF GRADUATE STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF MASTERS of ART DEGREE IN PUBLIC MANAGEMNT (MPM)

JUNE, 2014

JIMMA, ETHIOPIA

Determinants of Effective Household Solid Waste Management Practice in Jimma Town

By

Naol Soboksa

Approved by Examining Board

----------	----------
Main advisor	Signature
----------	----------
Co Adviser	Signature
----------	----------
Internal Examiner	Signature
----------	----------
External Examiner	Signature

June, 2014

Declaration

I, the undersigned graduate student , hereby declare that this MPM project paper is my original work, has not been presented for a degree in this or any other university and that all sources of the materials used for the thesis have been fully acknowledged.

Name: Naol Soboksa Megersa
Signature: ----------
Date: ----------

Confirmation
This thesis can be submitted for examination with my approval;

Principal Advisor: Ashenafi Haile (MA)

Co- Ardvisor: Dr. Wendaferaw Mulugeta (PhD)

Place: Masters of Public Management (MPM)
College of Business and Economics
Jimma University
Jimma

June, 2014

ACKNOWLEDGEMENT

First and for most I would like to express my gratitude to my principal advisors, Ato Ashenafi Haile (MA) and co-advisor Dr. Wondeferaw Mulugeta (PhD) who provided me with genuine, professional and constructive guidance, support and continuous encouragement to complete my thesis.

I would like to extend my sincere gratitude to Jimma town municipal administration and Green and Sanitation department for their cooperation especially head of municipality Ato Solomon Abebe for his kind help, willingness and patience in replying to the interviews and allow accessing of secondary data. In addition, I am grateful to my enumerators and respondents who spent their valuable time in filling questionnaire.

I am also thankful to all the members of private waste collectors for their valuable time spent with me to discuss and gave me helpful data for the accomplishment of my research work.

My appreciation is also extended to my friends especially Mr. Dejene Wodeja, Mr. Feleke Solomon, and Mr. Bacha Beyene for their continuous encouragement, moral and professional support towards the accomplishment of this thesis work.

My especial thanks go to my lovely sister Mis. Lalise Fufa for her authentic encouragement and moral support from the early begging to the end of my work.

Finally, I would like to express my appreciation and deepest thanks to my family as a whole especially my father Ato Soboksa Megersa for his moral, financial, spiritual, and all-round support for the successful accomplishment of my work and through all phases of my life.

ABSTRACT

This is report of thesis on the determinants of effective household solid waste management practice in a case of Jimma town- Ethiopia using both quantitative and qualitative research paradigms. The general objective of the study was; to analyze and identify the determinant factors of effective household solid waste management practice in Jimma town and forward the possible interventions. Data for the study was collected through the use of questionnaires for households, interview with the head of municipality (mayor) and focus group discussion with private waste collectors. The researcher used both quantitative and qualitative methods of analysis particularly descriptive and inferential statistics which include tables, charts (bar and pie charts), percentage, frequency, mean, standard deviation and Chi-square and T-tests to present and analyze data respectively. The result was significant and positive correlation between the households' sex, educational level, years of stay, awareness level, willingness to pay, access to private waste collectors, law enforcement, and effective household solid waste management practices. These variables are significant at 5% level. Similarly, human power, budget, facilities and equipments have positively significant relationship with effective solid waste management at household level. However, there is significant negative correlation between households' family size, distance of the households' house from the main road and effective household solid waste management at 5% level. Different from the above variables, both household heads' age and monthly income have no significant relationship with effective solid waste management at household level. As result indicated, there is no significance difference between the two groups of households (effective and ineffective) in both variables (age and monthly income). Moreover, no average mean difference between effective and ineffective groups of household heads on age (i.e. both are at 44.66 years) and it's the same is true for household heads on monthly income (i.e both are at 1667 birr). Therefore, unlike the other variables, households 'age and average monthly income are not the determinants of effective household solid waste management in the study area.

Key terms: Household solid waste management, Effective, private waste collectors (PWCs)

Table of Contents

List of tables

Tables **Pages**

List of figures

Figures **Page**

Acronym

CBO - Community Based Organization

CED – Centre for Environment and Development

CSA – Central Statistical Authority

FDRE - Federal Democratic Republic of Ethiopia

HHSWM - House Hold Solid Waste Management

MoH - Ministry of Health

MRGG – Management Resource for Good Governance

MSWM - Municipal Solid Waste Management

MUDC - Ministry of Urban Development and Construction

NGO - Non- governmental Organization

PPIAF - Public Private Infrastructure Advisory Faculty

PWC – Private Waste Collectors

RIPPLE – Research Inspired Policy and Practice Learning in Ethiopia

SWM - Solid Waste Management

UK - United Kingdom

UNCHS – United Nations Centre for Human Settlement

UNDP - United Nations Development Program

UNEP - United Nations Environmental Program

WB - World Bank

CHAPTER ONE

1. INTRODUCTION

1.1. Back ground of the study

The rapid urbanization that has been taking place during the 20th century virtually renovated the world in to communities of cities and towns facing similar challenges on environmental issues in which most of them have to be addressed at international level (Smith, 2010). From those environmental issues solid waste management is a critical one because as far as people have been living in settled communities, solid waste generation has been an unavoidable and serious issue both in developed and developing nations. As a result, solid waste management became a worldwide agenda at united nation conference on environment and development in Riodejieneiro in 1992 with a great emphasis on reducing wastes and capitalize on environmentally sound waste reuse and recycling at first step in waste management (UNEP, 1996).

Recently the rapid growth of economic activities and population in the world particularly in developing countries has caused an increased consumption of natural resources that has led to much waste generation in most areas. And also due to the fact that insufficient or lack of human and financial capacities to find the solution, unsafe waste disposal and ineffective solid waste management particularly household solid waste have become a serious problem in Africa and other developing countries. About 20 to 80 percent of the solid waste in African cities is disposed in open spaces, water bodies, and gutter as a result of inadequate infrastructures and awareness among the society (UNEP, 1999).

Solid waste management is defined as the collection, transportation, processing, recycling, and disposal of solid waste materials so as to reduce their effect on health, environment and aesthetics. It is highly associated with urbanization and industrialization (Federal Negarit Gezeta, 2007). It implies that with the expansion of urbanization and industrialization, solid wastes generation become increasing especially at household level with growing number of people in a given city or town. As a result, recent events in major urban centres both in developed and developing countries have shown that house hold solid waste management has become a big challenge.

According to Sarageldin (1995) and Rushbrook (1999); cited by Solomon (2006) about 30 to 50 percent of the solid waste generated in urban areas of low income countries as well as poorest parts of middle-income countries is estimated to be left uncollected. This is because of various factors which include lack of infrastructures, finance, inefficient institutional capacity and structure, political instability and low level of awareness. These situations brought several distresses to communities and endanger humans' health through direct contact, contamination of water and soil.

Dealing with the environmental costs in rapidly growing economic development, urbanization and improving living standards in cities have led to an increase in the quantity and complexity of generated wastes which represent a serious problem (UNDP, 2004). While cities are generating an ever-increasing volume of waste, the effectiveness of their solid waste collection and disposal systems can be deteriorating because of inefficient institutional capacity and a few involvements of private enterprises (private waste collectors) particularly in Ethiopia.

One of the proven ways of obtaining efficiency and effectiveness gain in solid waste management is through the involvement of the private sectors – that is when the key success factors of competition, transparency and accountability are present (Cointreau, et al, 2002). The private sector plays other important roles by mobilizing needed investment funds and providing new ideas, technologies and skills. Non- governmental organizations particularly NGOs in developing countries like Ethiopia raises funds for waste management especially solid wastes in line with private enterprises. According to Solid Waste Management Proclamation No. 513/2007, private sectors are permitted to perform the primary solid waste collection, transportation, and use or disposal of wastes. This situation, therefore, allowed an increased participation of the private formal sectors, CBOs and NGOs; yet no well organized and efficient sectors as well as inadequate involvement in Ethiopia.

Solid waste management is a growing public concern in Ethiopia. In many cities of the country, waste management is poor and solid wastes are dumped along roadsides and into open areas, endangering health and attracting vermin (RIPPLE, 2006). The amount of solid waste generation depends on the size of the population and the level of income of households (Girma, 2004; as cited by Solomon, 2006). This implies that when the number of population in a given area is increasing, the consumption of certain product will increase along with the waste generated from such consumable products and the same is true for the level of income because of the operation of numerous economic activities undertaken in the area.

Similarly, the current condition of house hold solid waste management practices in different towns of Ethiopia is also becoming a challenge for municipalities. For instance, a study conducted by (MoH, 1996 as cited by Gebrie, 2009) revealed percentage of solid wastes which are left uncollected and disposed on an open spaces without due attention regarding their consequences in different towns of Ethiopia.

Table 1.1: Percentage of uncontrolled solid waste in major towns of Ethiopia

Town	Percentage of uncontrolled solid wastes
Jijiga	82
Hawassa	75
Dessie	70
Dire Dawa	63
Jimma	63
Harar	53
Mekele	52
Addis Ababa	32

Source- MoH, 1996 as cited by Gebrie, 2009

As it is indicated in table 1.1, from major towns of Ethiopia, Jimma is one of the town by which proper provision of solid waste management services is still unsatisfactory and incomplete. In Jimma, illegal dumping of waste on open areas, in gullies, river courses is considered as routine task of residents. The efforts made by the municipality to change the situation in the town are also insufficient as it compared to the extent of the problem. In addition to this, according to the national consensus conducted consequently by the year 1994 and 2007, Jimma town had about 88,667 and 159,009 number of populations respectively. It depicts that the number of population in the town became increasing at alarming rate due to different factors may be rural-urban migration and natural growth. Likewise, the volume of solid waste generation at household level becomes increase with the increasing number of the residents in the town.

Hence, according to research conducted in June, 2008, household solid waste has remained a major challenge to the municipal government of Jimma town; household solid wastes are burning inside the villages, dumped near the road, disposed in the drain (gutter) and other open sites. It indicates that solid waste management in Jimma town at household level is not managed in a well manner which can be leading the problem of environmental image or soundness and economic efficiency.

Therefore, in order to reduce this situation and achieve effective house hold solid waste management practice of the town, detail study of the main determinants of effective house hold solid waste management practice is required.

1.2. Statement of the problem

According to the RIO Declaration (1992), it has been emphasized that all countries around the world must seek and invest in environmental beautification and safe waste management practices. This means that clean and health living conditions in cities and towns cannot be achieved without reliable and regular waste collection and adequate disposal systems. In developing countries including Ethiopia, existing facts indicated that the provision of solid waste management services in particular, and that of waste management in general, remain unsatisfactory and erratic or inconsistent with extensive use of unclean and unsafe waste disposal practices (Lall, et.al. 2004). Moreover, around 30-50% of residents in most cities in developing countries including Ethiopia do not get proper solid waste management services and most of the time their disposal practices are unsafe. This inadequacy is endorsed partially to weak institutional structure and insufficient municipal resources (Altaf and Deshazo, 1996).

In lower-income countries, as well as poorer parts of middle-income nations such as Ethiopia, an estimated of 30 to 50% solid waste produced in urban areas is left uncollected. Some viral and other infectious diseases are associated with waste and also serve as habitat formation for breeding insects and mosquitoes (Sarageldin, 1995 and Rushbrook, 1999; cited by Solomon, 2006). It implies that uncollected solid waste blocks drainage channels and increases the health problems related to pool stagnant water. In addition, accumulated wastes provide the ever-present hazard of physical injury to people coming into its close proximity, particularly children.

According to MUDC (2012), in large number of urban areas of the country, solid waste management services are either absent or insufficient. Solid waste management in Ethiopia is generally in a poor state particularly in Jimma town. For example, the collection services are often inefficient and do not cover all areas (arbitrary). In general, the unauthorized and most of the authorized dump sites are poorly managed causing significant environmental impacts.

According to Zelalem (2006), Solid waste management involves a wide variety of actors that constitutes households, CBOs, local and national government, private sectors and NGOs. As a result, effective solid waste management suppose the combined effort of these actors.

However, such cooperation is very few and integration of the actors towards waste management in general and solid waste management in particular is not as much in developing countries like Ethiopia. By 2002, there was no formal structure for charging waste generators and weak financial and cost recovery systems were one of the major causes of poor waste management performance in Ethiopia. Thus, there was considerable potential for improvements in SWM performance via efficiencies gained from the introduction of the private sectors. However, Private sector participation in SWM was limited to informal pre-collection companies particularly in Addis Ababa and other few cities like Jimma town (PPIAF, 2011). As mentioned earlier, Jimma town is characterized by rapid population growth caused by natural increase and migration. According to 1994 national census report, the town had 88, 667 total populations where as by 2007 national census reached 159, 009 with growth rate of 3.95%/annum. Such rapid increase in population together with rapid development of the town has produced increasing volumes of solid waste and in turn it induced greater infrastructural demand, institutional setup and community participation for its management. But, the town municipality which runs the solid waste management activities of the town could not fulfil the above requirements.

For instance, currently municipality has performing its activity by supplying one truck for collection, transportation and disposal of the town solid waste. Then, households are expected to store wastes on their sack, plastic bags or other temporary storage inside the home and hand over to private waste collectors. However, there are wastes which are dumped on open areas, road sides and river courses, gullies, burning inside the villages and throwing in sewerages by the households. In addition to this, there are a few public solid waste storage containers and road side dust bins (i.e it's arbitrary). So that it's highly suffered from shortage of solid waste management infrastructures and faced unmatched burdens of collection, transportation and disposal of solid wastes.

As a result, household solid waste management has not been carried out in a sufficient and proper manner. The environmental and sanitary conditions of the town have become more serious from time to time, and people are suffering from living in such conditions. So that urgent need of effective household solid waste management on one hand and steady growth of solid waste problem on the other side are still the main features of the town. Detail study of the overall condition of household solid waste management practice should be the first move required for reducing this gap. Therefore, this study is focused on examining and identifying the major determinants of effective household solid waste management practice of the town and tried to forward recommendation or appropriate solution for the problems.

1.3. Major research questions

Based on the above stated problem, the following research questions were forwarded and answered by the researcher in the study.

- How the existing performance of house hold solid waste management practice of the town is going on?.
- To what extent the determinant factors particularly demographic, socio-cultural and institutional factors able to influence household solid waste management practices in the town?
- Do the private sector (PWCs) delivering solid waste collection services in the town?
- Are there any sponsors particularly non-profit organizations (NGOs) doing over solid waste management currently in the town?

1.4. Objectives of the study

1.4.1. General objective

The study primarily aimed at examining and identifying the key determinants of effective household solid waste management practice in Jimma town and recommend appropriate intervention or solution.

1.4.2. Specific objectives

- To examine the present position of house hold solid waste management practices in jimma town.
- To analyze the extent to which demographic, socio-cultural and institutional factors influence effective household solid waste management practice in Jimma town.
- To examine whether any NGO has been giving sponsorship or doing over the solid waste disposal services in the town.
- To describe the ongoing performance of private solid waste collectors in the town.
- To recommend ways of improving house hold solid waste management practices in the town.

1.5. Significance of the study

The study plays a significant role in bridging the gap between effective solid waste management and the determinant factors in the study area. It is very important in raising awareness among the community all over the country particularly people of Jimma town regarding the importance of effective household solid waste management, waste control at source, garbage collection and safe solid waste disposal primarily by households with the assistance of local government authorities (Municipality) and building partnership within local stakeholders. It has also helps to gain and determine the waste handling knowledge, attitudes and practices along with households by identifying areas of deficiencies and the determinants that can influence effective household solid waste management. Thus, it may serve as a spring board for further studies that might be conducted on the effective household solid waste management and other relative areas in Jimma town including any other geographical areas all over the country. Moreover, it is supposed to provide lessons and guide line information to policy makers, solid waste managers (municipality), NGOs, private enterprises and environmental protection agencies about the existing situation and factors that can influence effective household solid waste management practice of Jimma town to develop effective strategy in order to mitigate the problem of solid waste management.

1.6. Scope of the study

Obviously, there is a chronic problem of solid waste management throughout the country. To resolve this problem it requires urgent action. As a result, solid waste management get high attention from the government, NGOs, researchers, communities and private sectors. The study was limited to household solid waste management practice in Jimma town. This is mainly because, there is a severe problem of household solid waste management practice and limited surveys or no investigations which were conducted so far regarding the factors that can determine effective household solid waste management in the town. Basically, there are different factors that can influence the management of solid waste at household level, but this study delimited to the following major factors such as demographic, socio-cultural and institutional factors. Hence, solid waste management has various participants (stakeholders) who actively engage in environmental protection and beautification; however, the study focused on household solid waste management practice and the performance of private sector (private waste collectors) in the town.

As mentioned above, it is difficult to conduct a research at national or Regional level because of the difficulty to collect and analyze data since it requires a huge amount of resources (human, material, time and financial). Therefore, the study delimited to household solid waste management practice in Jimma town.

1.7. Limitation of the study

As early stated, solid waste which is a consequence of day-to-day activity of human kind, needs to be managed properly. But most Ethiopian cities like cities of other developing countries, faces problems associated with poorly managed solid waste operation. This pulls various development actors like NGOs, policy makers, researchers and other development institutions throughout the country. Even though, because of the time and financial limitation, the study mainly focused on specific Zonal city. As a result, the finding of the thesis is not stand for national, regional and other geographical areas or other Zonal cities. This thesis also concentrated on solid waste management practice at household level. Thus, it's difficult to generalize the product of the thesis to the other types of solid wastes such as municipal, Industrial and other solid wastes in the town. In addition, the study mainly focused on the determinant factors of effective household solid waste management practice but not centred on the challenges, effects, current situation and prospects of household solid waste management in jimma town.

1.8. Operational Definition of Variables

1.8.1. Dependent variable

A. Effectiveness

It is an ample situation in which household solid waste disposal practice is carried out in a proper manner. Moreover, households are likely dispose its solid waste either through private waste collectors or by using the public containers near to their house and regulated dump site, otherwise its illegal (ineffective). In relation with this, Memo (2002) as cited by Ashenafi (2011), define effective household solid waste management as the occasion of the household that store its solid wastes using various storage facilities and hand over to the waste collectors or dumping to the available public containers near to the residential areas. In other words, households also dispose its solid wastes legally in a regulated dump site provided by the municipality of the town.

Moreover, effectiveness of the HHSWM is coded as 1 if households dispose its solid wastes effectively and 0 if ineffective, but effectiveness of households is categorized in to effective and ineffective groups based on the solid waste disposal practices (legal and illegal) carried out by the households in general.

1.8.2. Independent variables

It is a combination of demographic, socio-cultural and institutional factors that are likely to have an impact over effective household solid waste management practice in the study area. In line with this, the researcher was formulated hypothesis in order to test whether expected outcome is realized or not or whether the determinant factors have an impact over proper household solid waste disposal practice in the study area. Given that the variables were clarified and hypothesized as follows:

A. Sex: It is discrete variable that refers to the biological sex of the households and is standard one in survey and administrative data. It is coded as 1 if the sample household head is male and 0 if it's female. As usually observed, women are more responsible to keep clean their houses and compound than men. In addition, the traditional society assumed that women are limited to the domestic works particularly cleaning in to the compound. This trend clarified that women are mostly eager to handle its wastes at hand as compared to men. Therefore, it is expected that female headed household might be manage its solid wastes effectively than male headed households.

B. Age: It refers to the number of birth day anniversaries passed on the date of reference. Age is discrete variable expected that has negative relationship with effective household solid waste management. This is due to the fact that obviously believed youths and adults take more responsibility and committed to care for the environment particularly sanitation than elders. Most probably, elders might be thought that environmental protection particularly solid waste management is the responsibility of the government. Therefore, it is assumed that old aged has negative impact over effective solid waste management.

C. Education level: It refers a number of years stayed in school. Moreover, education is a discrete variable which has expected to positively influence effective solid waste management at household level. That means as per the increment of educational level, understanding level of the individuals towards the negative impacts of improper waste management would be increased.

It is also clearly confirmed by Ashenafi (2011) that household solid waste management is improved with the increment level of education of the household head.

D. Monthly income: It is a continuous variable measured as the average income or money the households get per a month. It is supposed that average monthly income of the households have positive relationship with effective solid waste management at household level.

E. Years of stay: It is a continuous variable measured as the number of years the households stayed in a specific area. It is expected that number of years the household stayed could positively influence the effective solid waste management practice at household level.

F. Family size: It is a continuous variable measured as the number of household members' lives together in the same house. It is supposed that solid waste management is negatively influenced by households' family size. Obviously, it is believed that when the number of family size increase, the volume of solid waste also increases respective to the amount of consumed products in the house. This might be enforcing the households to illegal disposal practices subsequent to the volume of the waste generated in the house per day.

G. Location: It is a continuous variable which refers to the distance of the household's house from the centre or main road in meter. It is also expected that location has negative influence over solid waste management practice at household level. This means that the long the dwelling area from the centre, the ineffective solid waste disposal practices would be performed.

H. Awareness level: It is a discrete variable that refers to the household's level of understanding towards the importance and ways of solid waste management in a given area. It is coded as 1 if the household is believed that SWM is important, 0 otherwise. It is hypothesised that the level of awareness of households positively influence the effective ways of household solid waste management practice in the study area.

I. Willingness to pay: It is a discrete variable that refers to the interest of the household's to charge for door to door solid waste collection service provided with waste collectors. It has positively influence effective solid waste management practices at household level. It is coded as 1 if the household is willing to pay, 0 otherwise.

J. Law enforcement: It is the extent to which the rules and regulations of solid waste management is applicable or enforced by the concerned body particularly municipality. It is a discrete variable expected to positively influence effective household solid waste management practice. That means the strong law enforcement the effective household solid waste management would be achieved.

K. Access of PWCs: It is a discrete variable which takes 1 if households' have access of PWCs, 0 otherwise. It is expected to positively influence effective solid waste management at household level.

1.9. Organization of the thesis

This paper is organized in to five major chapters. The first chapter consists an introductory part of the paper which includes background of the study, statement of the problem, objective of the study, research questions, significance of the study, scope of the study, limitation of study and operational definition of variables. The second chapter deals with review of related literature obtained from various published and unpublished reference materials. The third chapter contains research methodology, rationale for study, description of the study area, research design, sources and type of data, methods of data collection, sampling and analysis. The fourth chapter deals with result and discussion which present analysis and interpretation of data about the determinants of effective household solid waste management practice of the town. The last chapter (chapter five) includes conclusions and recommendations. Bibliographies/references and appendices attached at the end of the paper.

CHAPTER TWO

2. REVIEW OF RELATED LITERATURE

2.1. Theoretical literature

2.1.1. Definition and concepts

Waste is often found as liquid, gas or solid forms. According to UK environmental protection act (1990), waste is defined as 'any substance which comprises scrap materials, sewage or other unwanted left-over arising from use of any substances or article which requires to be disposed of which has broken, damaged, contaminated or otherwise spoiled'. In other words, waste consists of unwanted materials left over from manufacturing process (industrial, commercial, mining or agricultural operations) or from community and household activities. The material may be discarded or accumulated, stored or treated (physically, chemically or biologically) prior to being discarded or recycled.

Solid waste- includes any garbage, rubbish, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility, and other discarded material including solid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining, and agriculture operations and from community activities (Joseph, 1984 as cited by MUDC, 2012).

According to Federal Negarit Gazeta of FDRE Solid waste management proclamation No. 513/2007, Solid waste means anything that is neither liquid nor gas and is discarded as unwanted. It is also expressed that solid waste is the unwanted or useless solid materials generated from combined residential, industrial and commercial activities in a given area. It may be categorized according to its origin (domestic, industrial, commercial, construction or institutional); according to its contents (organic material, glass, metal, plastic paper, etc) and according to hazard potential (toxic, non-toxic, flammable, radioactive, infectious, etc).

Household solid waste- is made up of everyday items which comprising of garbage and rubbish such as bottles, cans, clothing, compost, food packaging, food left-over, news paper, magazines, and yard or storage trimmings that originates from private homes or apartments. In other words, household solid wastes are wastes that are mostly found or generated at home.

Typically, this includes food left-over, packaging (bottles and cans), newspaper and other papers, and miscellaneous items that have been used up or broken and are thrown out as waste (e.g., ashes, fruit garbage, old shoes, worn out clothes, broken cooking pot, used paper, useless baskets, used bags, etc) (Melaku, 2008).

Solid waste management- is defined as the discipline associated with the control of generation, storage, collection, transfer and transport, processing and disposal of solid wastes in a manner that is in accordance with the best principles of public health, economics, engineering, conservation, aesthetics, and other environmental considerations, and that is also responsive to public attitudes (Techobarglous, 2002).

According to the Federal Negarit Gazeta of FDRE Solid waste management proclamation No.513/2007, Solid waste management means the collection, transportation, storage, recycling or disposal of solid waste, or the consecutive use of a disposal site that is no longer operational. It is also stated that management of solid waste reduces or eliminates adverse impacts on the environment and human health and supports economic development and improved quality of life. A number of processes are involved in effectively managing waste for a municipality. These include monitoring, collection, transport, processing, recycling and disposal (Schubeler, 1996).

2.1.2. Sources and type of solid waste

In order to categorize solid waste, there have been various approaches of categorization based on numerous classification criteria. Some of those criteria are source from which solid waste emanates, and nature of solid waste components. On the basis of the nature of items, solid wastes can be classified into organic or inorganic, combustible or non-combustible, and putrescible or non-putrescible (Edelman, 1997; as cited by Solomon, 2006). In addition, based on its risk potential, it can also be categorized in to hazardous and non hazardous wastes (CED, 2003).

With respect to source from which solid waste emanates, (Martin, 2000) classified solid waste as household (domestic) wastes, institutional wastes, street sweepings, commercial wastes, construction and demolition debris. In developing countries, SW also contains various amounts of industrial wastes from small scale industries. In these sources there are diverse types of solid wastes. But, some of typical solid wastes of those sources are described by Dereje (2001) as follows:

Domestic solid wastes: wastes generated from household activities such as food preparation, cleaning, fuel burning, old cloths, furniture, obsolete utensils and equipment, packaging, newsprint, and garden wastes. In developing countries, food waste and ashes dominate households' solid wastes.

Commercial wastes: waste from shops, offices, hotels, restaurants, etc and typically consisting packaging materials, office supplies and food wastes. In low income countries food markets contribute the largest proportion of commercial waste.

Institutional wastes: waste from schools, hospitals, clinics, government offices, military bases etc, and constitute hospital and clinical wastes including potentially infectious and hazardous materials.

Industrial wastes: composition of industrial waste depends on the kind of industries involved. It consist food waste from kitchens, and cafeterias, packaging materials, plastics, papers and metal items.

Street sweepings: Include dust, soil, leaf, paper, etc. In developing countries Street sweeping also consists of fruit and vegetable residues thrown by scavengers, household wastes dumped along roads, drain cleanings, animal manure or dung and plant remains.

Construction and demolition wastes: its composition depends on type of construction materials used, but typically includes soil, brick, stone, metals, concrete, ceramic materials, wood, packaging materials and the like.

2.1.3. Characteristics of solid waste

For effective and efficient management of solid waste generated in a particular city, adequate knowledge and data about the characteristics of solid waste is essential. In order to decide or determine types of facilities required for solid waste management, best disposal options, and projecting future needs requires precise information about quantities, compositions, densities, moisture content and calorific value of solid waste produced in a city (Rushbrook, 1999; as cited by Solomon, 2011). Though all the above characteristics are important, it is too better to emphasize on solid waste physical composition and generation rate for this thesis. Because, physical composition and generation rate wastes are directly related with household solid waste in a case that suggesting kinds of discarded materials and amounts of waste generated in a given period even per household with in specific area.

Solid waste generation rate: refers to the amount of waste disposed during a given period of time and can be measured at the point of generation through use of vehicle survey and

examination of records at the disposal facility (UNEP, 2009; cited in Zebenay, 2010). The rate of solid waste generated in a given town is basically determined by demographic growth, seasonal variation, geographic location, economic development and people's attitude towards waste.

Nashim (2004) explained that the influence of economic development by comparing gross national product of developed and developing countries with their waste generation rate. He concludes that the higher the gross national product of a country result the higher the generation of waste. It means due to difference in level economic performance, waste generation rate of developed countries is highly greater than that of developing countries. Although developing countries have a lower rate of waste generation compared to developed countries, their quantum of waste is high owing to their higher levels of population growth. This clearly shows impact of population size on waste generation rate. On the other hand, people's attitude towards waste can also conditioned solid waste generation rate in the form of their pattern of material use and waste handling, their interest in waste reduction and minimization, and the degree to which they refrain from indiscriminate dumping and littering (Schubeler, 1996).

Therefore, an accurate knowledge of quantity and rate of solid waste generation in a given area is essential for preparation and implementation of appropriate MSWM. Because it provides information on human, financial and equipment resources required for collection and transportation of waste, to enact appropriate laws on waste reduction, and establish current and future needs for solid waste disposal sites (Abel, 2007).

Physical composition: refers to quantity of various material types in a particular waste stream. Just like waste generation rate, physical composition of solid waste is also extremely variable as a consequence different factors (Samuel, 2006). The major once are the following:

a). Economic level difference: higher income areas are usually produce more inorganic waste while low income areas produce relatively more organic waste.

b). Demography (difference in amount of population for example, tourist places).

c). Locations: includes abundance and type of regions' natural resource, and socio-cultural factors n which highly contribute for variation of waste in different areas.

d). Season: for instance during certain season's yard wastes such as grass clippings and raked leaves add greatly to solid waste.

Unlike various composition of solid waste in different areas, process of defining waste composition is similar in each area i.e. by measuring mass percentage of each material group

present in an area. Conduct of waste composition studies by using this method has several importance's; Some of these are: for identification of potential resource recovery activities, facilitate collection, transport and processing equipment, taking essential health, aesthetic and environmental precautions, and for monitoring changes in waste composition over time and improving waste management system (Gidarkos, *et al*, 2008, p.1). Therefore, composition study is core stone for successful planning and implementation of solid waste management.

2.1.4. Basic aspects of Solid waste management system

2.1.4.1. Solid waste storage facilities

Solid waste storage facilities may be classified as primary (or individual) and secondary (or communal) storage facilities. As far as possible, the storage facilities must be animal proof (resistance), insect-proof, washable and robust enough to meet the exigencies of normal use (Rajinikanth and Rammachandra, 2000). The storage volume required for household wastes is a function of the number of premises served, rate of waste generation, family size and frequency of collection. On the other hand, the storage capacities required for commercial and institutional premises will be determined by the size of the premises, nature and waste generation (UNCHS, nd).

A. Primary solid waste storage facilities

A variety of facilities are used for primary storage of solid wastes. Temporary containers, such as cardboard boxes and plastic carrier bags, are used in poorly serviced areas. Standardized use of purpose-made plastic waste bags is often inappropriate for developing countries as they require careful organization to distribute and their attractiveness for alternative uses and susceptibility for tearing. Reusable heavy duty plastic bags, with an average useful life of six months have been successfully used in Zimbabwe while after this period the bags are removed for recycling into new bags (UNCHS, n.d). Many of the primary storage waste facilities commonly used do not protect against breeding of flies, and the use of container lids is essential to protect and interrupt the breeding process (Nashim, 2004). He also noted that plastic and galvanized-iron bins with lids are commonly used in middle income and high income areas, but they are relatively valuable and, hence, susceptible to theft. Containers made from used car and truck tires, with capacities ranging from 30 to 80

liters, when fitted with a suitable lid, offer a useful fly-proof, washable, robust and low cost alternative.

Depending on the method of waste collection, the standardization of primary-storage facilities could maximize labour and transport productivity. This is especially true for waste collection methods that rely on the direct handling of primary waste-storage equipments by municipal workers. No such advantage is derived in the case where municipal workers only handle secondary-storage facilities, such as communal bins. Standardization of primary waste storage facilities does, however, pose a considerable problem with regard to their organization, maintenance and distribution. Thus, standardization of primary storage might, only be suitable when waste generation rates are high, usually greater than 25 litters of daily capacity. Consequently, standardization might only be relevant to high income areas of developing countries (UNCHS, nd).

Collections of materials at source are termed 'kerbside collection systems'. This method involves the householder putting out recyclable materials for collection separate from the normal refuse. In the separation at source scheme, the householder is either required to place recyclable materials into one container for sorting by the collectors (including informal sectors), or the recyclable materials are placed in separate containers (WB, 2004).

B. Secondary solid waste storage facilities

According to Schertenleib and Meyer (1992), secondary waste storage facilities may be either stationary or portable units. The stationary units are commonly uncovered, and the waste is often scattered around the facility where insects, rodents and animals are attracted to it. Wastes from stationary units have to be removed by raking out on to the ground and collecting in baskets before being carried to the vehicle. This is often demeaning, unhealthy and time consuming task which limits productivity of both labor and vehicles. In portable storage facilities, the vehicle deposits an empty container and collects a full one. They stated that vehicle productivity in general is maximized in portable units since time taken to set down an empty container and load a full one is very small (typically one minute), and with appropriate tipping gear fitted to the vehicle, the tipping operation also requires minimal time to complete. Hence, the overall round-trip time is essentially composed of travel time for shuttling back and forth to the disposal site. The requirement of labor is also minimal as compared to the stationery containers.

Generally, in uncovered containers the wastes are susceptible to scavengers that lead to the scatter of wastes with concomitant health problems. Flies play a mechanical transmission of faces and thus of faecal-oral diseases in uncovered piles of rotting waste. The mosquito will breed under these situations where piles of waste contain mosquito breeding sites and may transmit dengue, yellow fever, and other arboviral infections (Gairncross and Feachem, 1993; as cited by Prime Consultants, 2008).

Various types of solid wastes have certain maximum limits of source storage after which they may lead to adverse impacts even though there are variations in accordance with the local climate, storage mechanism and other local conditions.

2.1.4.2. Methods of solid waste collection

A. Communal collection

Under the communal collection system, householders discharge their wastes at predetermined locations having some form of communal storage facility, and collection vehicles collect the wastes at frequent intervals. The frequency with which communal storage facilities should be distributed is often dependent on the extent to which a community is willing to cooperate in its proper use. Accordingly, the containers should be spaced so that the distance between any two containers does not exceed 200 meters (Zurbrugg, 2003). In some studies, the recommended distance between two communal containers set is about 150 meters.

B. Block collection

As stated by Zurbrugg (2003), under block collection system, a collection vehicle travels a predetermined route at intervals that suit the capacity and schedules of the municipality, usually every two to three days, and stops at selected locations. Consequently, the householders bring their wastes using containers upon hearing the bell, and hand them over to the sanitation crew.

C. Kerbside (entrance) collection

Under this system, the crew collects containers of waste which are deposited at the Kerbside at fixed intervals, usually on two specific days in the week. In effect, this system requires a very regular and well organized collection service, so that householders know when to leave out their wastes. Kerbside collection could be mainly applicable in high-income areas of the developing world as it incurs a relatively high collection cost (UNCHS, nd).

D. Door -to -door collection

In door-to-door collection system, the collection crew enters each premise, takes out the container and sets it back after emptying the waste into collection vehicles. The lack of householder involvement in the collection process is, however, offset by increased labor costs in entering all premises. The door-to-door collection method only proves productive when collection is infrequent, typically once a week (Degnet, 2003).

E. Transport condition

According to UNCHS, many sources of waste might only be reached by roads or alleys which may be inaccessible to certain methods of transport because of their width, slope, congestion or surface. This is especially critical in unplanned settlements such as slums or low income areas and thus largely affects the selection of equipment. Road conditions, traffic density, and overall haul distance will have a determining influence on vehicle choice. Besides to motorized vehicles, non-motorized vehicles should be considered which are mainly used to transfer wastes to communal containers or to disposal sites (in small towns) that are found near the towns. It stated that non-motorized vehicles are also recommendable in narrow and filthy roads, dense settlement areas and in inaccessible parts of large towns. In large towns or cities, the non-motorized vehicles should be used only to transfer wastes to communal containers.

2.1.4.3. Solid waste disposal techniques

According to MUDC (2012), three approaches, namely, sanitary landfills, incinerations and various reuse techniques can be employed to dispose and handle solid wastes. However, almost all the towns of the country use open dumping sites with various negative impacts on the environment including human beings.

A. Sanitary landfills

Before discussing sanitary landfill sites, it is helpful to discuss about open dump sites as large number of Ethiopian towns/cities currently depend on such types of open dump sites. The open dump of solid wastes is very common in developing countries. Open dump sites for solid wastes are unsatisfactory in health, environmental and aesthetic grounds. In open dump sites, solid wastes are generally spread over large areas which are sources of food and harbourage for rats, flies and vermin, and also be a source of odour and smoke nuisance, a fire hazard, and a cause of water pollution.

Sanitary landfill is a method of disposing of solid wastes in a manner that protects the environment including human health in that the wastes are spreading and sealing in thin successive layers of earth and the wastes are compacted (Zubrugg and Scherten leib, 1998). It should, however, be noted that there are various types of sanitary landfills (including area landfills, trench landfills, and mounded landfills) that employ various technical approaches.

Most of the problems encountered in open dump sites will not occur in sanitary landfill sites. Sanitary landfill sites are usually designed to serve for a period of 20 to 40 years (MUDC, 2012). Projects related to sanitary landfills should undertake environmental impact assessment so as to mitigate the various environmental impacts that could occur during the construction and operational periods.

B. Incineration

Municipal incinerators can be used to deal with waste; industrial waste and human bodies. Typically municipal incinerators operate at roughly 800 to 1000 oc, which renders most domestic and agricultural materials chemically harmless and free of organisms; it also reduces the rubbish to much less bulky, easier to handle ash. Incineration is more advantageous than open dump sites from health perspective, as the high temperatures destroy pathogens and their vectors (WB, 2004).

C. Reuse and recycling mechanism

As mentioned by Kofoworola (2007), some of the reusing and recycling mechanisms are as follows:

- Resource recovery- is a broad term that is used for the retrieval of valuable materials or energy from a waste stream.
- Reclamation- is the separating out of materials such as rubber, glass, paper and scrap metal from waste and the act of reprocessing them for reuse.
- Composting- is an age-old process, wherein the organic fraction of wastes is heaped into piles and allowed to decompose in that after about six months humus like substance remains and makes an excellent soil conditioner.
- Hydro pulping- is a method that is used to recycle paper products.

2.1.4.4. Other aspect of consideration

A. Institutional arrangement

According to MUDC (2012), institutional aspects of MSWM concern the institutional structures and arrangements for solid waste management as well as organizational procedures and the capacity of responsible institutions which include the following:

- Distribution of functions, responsibilities and authority between local, regional and central government institutions (i.e. decentralization), and among local governments in a metropolitan area
- Organizational structure of the institutions responsible for MSWM, including the coordination between MSWM and other sectors and/or urban management functions
- Procedures and methods employed for planning and management
- Capacities of institutions responsible for MSWM and the capabilities of their staff
- Private sector involvement and participation of communities and user groups

An institutional issue including the current and intended legislation and the extent to which it is enforced, and also affects the solid waste management system. The policy environment pertaining to the involvement of the private sector including the micro and small scale enterprises also affects the system (Ibid). Besides, the capacity of the institution that handles the overall solid waste management system has an impact in the overall efficiency of the solid waste management system. According to the (ECA 1996, cited by Prime Consultants, 2008), the inability of municipalities in Africa to manage an efficient solid waste management system is partly attributed to the relegation of waste handling and disposal to the lowest levels of responsibility.

Towns should have an appropriate institutional arrangement that handles solid waste management in accordance with the amount of generated solid wastes and other related factors.

B. Number of population, income of the dwellers and revenue of the municipality/town

The number of population, income of the dwellers and revenue of towns/cities also affect the amount of generated wastes which is in one way or another closely associated with the aforementioned factors. Urban areas with higher number of population generate higher amount of solid wastes as compared with lower number of population having comparable income.

Income is also an important factor where the consumption of dwellers with higher income is relatively higher than the lower income group with corresponding generation of relatively higher amount of solid wastes (Melaku, 2008).

As noted by Schubeler (1996), revenue of municipalities has also an important bearing on the solid waste management of urban areas where cities/towns with relatively higher revenue can put in place improved solid waste management systems as compared to municipalities with limited amount of revenue.

C. Awareness and attitudes

Public awareness and attitudes to waste can affect the whole solid waste management system. The components of the solid waste management in one way or another depend on public awareness and participation. Hence, public awareness and attitude is one of the crucial issues which determine the success or failure of solid waste management system (UNEP, 2009). In order to change solid waste management significantly, the behaviour and attitudes of individuals and groups in the society will have to change. In this regard, the attitudinal change of the government, the private sector, individuals and lobby groups and NGOs has of paramount importance.

2.1.5. Policy and legislative frame work for solid waste management in Ethiopia

Even though there are various policy and legislative aspects that are in one way or another related to solid waste, an attempt has been made to focus on the environment policy of Ethiopia and solid waste management proclamation (No. 513/2007).

2.1.5.1. Environmental policy of Ethiopia

The following policy issues which are related to solid wastes are indicated in item No.3 of the FDRE Environmental Policy of Ethiopia (1997), i.e. "human settlements, urban environment and environmental health".

- To ensure that improved environmental sanitation be placed highest on the federal and regional agendas for achieving sustainable urban development
- To promote the construction by individual families of their own houses and create conducive conditions for communities and individual families to make improvements

to their immediate habitats as well as to provide human and domestic waste disposal facilities

- To recognize the importance of and help bring about behavioural change through education and public awareness of environmental sanitation problems in trying to achieve demand-driven community led programmes of improved urban environments as well as the sustainable use and maintenance of sanitation facilities
- To bring about a sound partnership between the government and communities in the development of an integrated sanitation delivery system, and to foster the supplementary role of NGOs
- To give priority to waste collection services and to its safe disposal
- To create conducive conditions for families, housing groups and communities to construct latrines and for private entrepreneurs to undertake latrine emptying as well as waste collection and disposal services
- To undertake studies which identify suitable sanitary landfill sites in the major cities and towns of Ethiopia
- To the extent possible to recycle liquid and solid wastes from homesteads and establishments for the production of energy, fertilizer and for other uses.

2.1.5.2. Solid waste management proclamation No. 513/2007

As mentioned by FDRE Solid Waste Management Proclamation No.513 /2007, the rationale behind the formulation of the proclamation is:

- To promote community participation in order to prevent the adverse effect and to enhance the benefits resulting from solid waste
- The solid waste management action plans designed by and implemented at, the lowest administration unit of urban administration can ensure community participation.

The objective of the proclamation is to enhance at all levels capacities to prevent the possible adverse impacts while creating economically and socially beneficial assets out of solid waste (Ibid).

AS noted by FDRE Solid Waste Management Proclamation No. 513/2007, among other issues, the proclamation sets out the following:

Article 4: General Obligation of Urban Administrations

- Urban Administration shall create enabling conditions to promote investment on the provision of solid waste management service.

- Any person shall obtain a permit from the concerned body of an urban administration prior to his engagement in the collection, transportation, use or disposal of solid waste.

Article 5: Solid Waste Management Planning

- Urban Administrations shall ensure the participation of the lowest administrative levels and their respective local communities in the designing and implementing their respective solid waste management plans.
- Each region of urban administration shall set its own schedule and, based on that, prepare its solid waste management plan and report of implementation.
- The plan and report referred to under sub–article (2) of this article shall be consolidated based on the solid waste management plan and implementation report of the lowest administrative units.
- Urban administrative may transfer the following responsibilities to their lowest administrative units:
    - The formulation and implementation of action plan on solid waste management
    - Ensuring the installation of marked waste bins by street and other public places
    - Ensuring the collection of solid waste from waste bins with sufficient frequency to prevent overflow
    - Planning and carrying out public awareness raising activities and
    - Ensuring that measures are taken to prevent pollution arising from mishandling of solid wastes

Article 11: Management of Household Solid Wastes

- The head of each household shall ensure that recyclable solid wastes are segregated from those that are destined for final disposal and are taken to the collection site designated for such waste.
- Urban Administration shall in the residential areas designated pursuant to sub-article of this article, ensure that adequate household solid waste collection facilities are in place.
- It is prohibited to dispose of litter on streets, waterways, parks, bus stop, train station, sport fields, water bodies in urban areas or in other public spaces while litter bins are available.

Zebenay (2010) also noted that improper waste management also increases Green House Gas (GHG) emissions, which contribute to climate change. Planning for and implementing a comprehensive program for waste collection, transport, and disposal- along with activities to prevent or recycle waste- can eliminate these problems.

As it is noted earlier a typical solid waste management system in a developing country displays an array of problems including low collection coverage and irregular collection services, and crude open dumping and burning without air and water pollution control. These problems are caused by various factors which constrain development of effective solid waste management systems. They can be categorized into technical, financial, institutional, social constraints, and awareness and attitudes (Ogawa, 2002). Each of these constraints is discussed below.

2.1.6.1. Human and technical constraints

In most developing countries, there is lack of human resources and technical expertise both at national and local levels. Many officers in charge of municipal solid waste management, particularly at the local level, have little or no technical background or training in engineering or management (Ogawa, 2002). This is a main reason for lack of comprehensive waste management planning in developing countries.

He also noted; furthermore, collection and analysis of solid waste data are generally not given sufficient attention. As a result, there are few opportunities for waste management administrators to become experts and to formulate and implement waste management plans that are tailored to the actual situation in their country. This in turn makes it extremely difficult to license or develop technologies that are best suited to the local conditions.

Moreover, research and development activities in municipal solid waste management have often low priority in developing countries. This lack of research and development activities in developing countries leads to selection of inappropriate technology in terms of local climatic and physical conditions, financial and human resource capabilities, and social or cultural acceptability. Several guides or manuals on appropriate solid waste management technologies in developing countries are available in the literature, and selection of technology could be made sometimes based on these guides. However, in most cases these guides must be modified to local conditions prevailing in the country, and therefore local studies are normally still needed (Ibid).

- Each Urban Administration shall delineate residential areas wherein the provision of this article shall have compulsory application.

2.1.6. Problems and challenges of solid waste management in developing countries

Managing solid waste in our society has been a challenge for as long as people have gathered together sufficient numbers to impose a stress on local resources. Waste and other waste stream needed to be removed from the human environment to avoid nuisance and health problems, and the wide environment provided with an ample sink for these negative effects of human life (Nag, 2005, p.106). He also stated that open dumping of waste presents a real threat to the environment and to human health is common place in developing countries. Constrained by budget pressures, towns and cities in the southern hemisphere are struggling to deal with the proliferation of solid waste. Global production has practically doubled over the past ten years and is expected to reach 2.5 billion tonnes per year in 2025 as a result of the combined effect of urban development and changes in consumption patterns (Claude, 2012).

Solid waste management in urban centres in developing countries, such as Addis Ababa, still remains one of the largest challenges that public administrations face because of the increasing quantities of different materials streams, which become more and more complex and diverse as demographic and economic growth rise (Zerayakob, 2002; as cited by Nigatu, *et al*, 2011). The need to confront this problem is not met with sufficient financial, technical, and human resources. Thus situation of inadequate solid waste management is pervasive in developing or transition economies (Zurbrugg and Scherten leib, 1998). They stated that adequate planning of waste management is essential if communities and regions are to successfully address the challenge of a sustainable development, including resource conservation, climate protection, and pollution prevention. However, planning is mostly limited to operational planning, i.e. how to construct and operate the system at hand.

Waste generation increases with population expansion and economic development. Improperly managed solid waste poses a risk to human health and the environment. Uncontrolled dumping and improper waste handling causes a variety of problems, including contaminating water, attracting insects and rodents, and increasing flooding due to blocked drainage canals or gullies (Ibid). In addition, it may result in safety hazards from fires or explosions.

2.1.6.2. Financial constraints

SWM is given low priority in developing countries; as a result, very limited funds are allocated to the sector by government. This problem is acute at the local government level where local revenue collection system is inadequately developed and financial base for public service including SWM is weak (WB, 2004). In addition to limited funds, many local governments in developing countries lack good financial management and planning. For instance, "in a developing country town over 90% of annual budget provided for solid waste management was used up within first six months. Lack of financial management and planning, particularly cost accounting depletes limited resources available for the sector even more quickly and causes solid waste management services to halt for some periods, thus losing trust of service users (Zurbrugg, 2003 as cited by Gebrie, 2009, P.22).

2.1.6.3. Institutional constraints

The waste management regime in developing countries is seldom integrated, and there is often no clear assignment of responsibilities and schedules among the organizations involved. Furthermore, there is often no umbrella organization to coordinate overlapping responsibilities for waste management that involve more than one agency. This situation not only hinders effective implementation of waste management operations, but also produces confusion in relation to technical cooperation and assistance projects among donors (Gidarakos, *et al*, 2008). Along with these organizational and structural problems, lack of an effective legal system and technical standards constitute a major constraint. According to WB (2004), legal provisions related to solid waste are often incorporated as fragmented elements in disparate laws, such as laws for public hygiene, local administration, and environment protection. Generally speaking, there is no integrated legal framework to deal with waste management in developing countries.

2.1.6.4. Social constraints

As stated by Gebrie (2009), social status of solid waste management workers is generally low both in developed and developing countries, but more severe in developing countries than developed countries. Such people's perception leads workers to disrespect their work and in turn produces poor quality of their work. At dump sites, transfer stations, and street waste bins, waste picking or scavenging activities are common scenes in developing countries. People involved have not received school education and vocational training to obtain knowledge and skills required for other jobs. They are also affected by limited employment opportunity available in formal sector (Cloude, 2012). The existence of waste pickers (scavengers) creates often an obstacle to the operation of solid waste collection and disposal services. However, if organized properly their activities can be effective in waste management system. Such an opportunistic approach is required for sustainable development of solid waste management programs in developing countries (Ogawa, 2002).

2.1.6.5. Awareness and attitudes

Public awareness and attitudes to waste can affect the whole municipal solid waste management system. All steps in municipal solid waste management starting from household waste storage, to waste segregation, recycling, collection frequency, willingness to pay for waste management services, and opposition to sitting of waste treatment and disposal facilities depend on public awareness and participation. Thus, lack of public awareness and education about the importance of proper solid waste management for health and well-being of people severely restricts use of community based approaches in developing countries and also crucial factor for failure of a MSWM service in developing countries (Zurbrugg, 2003).

2.1.7. Effects of solid waste

If it is not well managed, solid waste has significant negative externalities with impact on the environment and health. Uncollected solid wastes in cities provides a favourable habitat for insects, vermin, and scavenging animals, which proliferate and spread air and waterborne diseases such as plague, dengue fever and diarrhoea among local populations (Gerold, 2009). Moreover, when not disposed of with sound sanitary practices, leachate produced by accumulated solid waste can leak in to the environment and contaminate ground water and surface water.

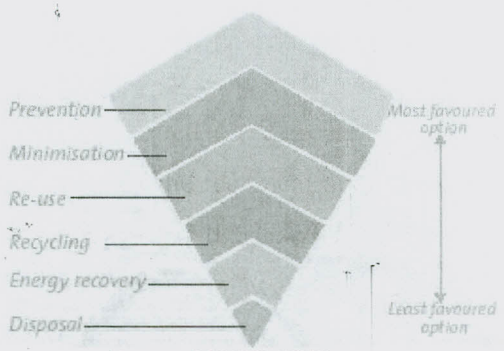
Solid waste also contributes to some global environmental effect, such as the increase of Green House Gas (GHG) emissions in the atmosphere-contributing almost 5% of total human-based GHG emissions (Hanrahan, *et al*, 2006). They assure that open burning in dumpsites releases particulates as black carbon and persistent organic pollutants which bio accumulate in the food chain. In addition, many cities engaged in flood management programs recognize that uncollected solid waste- which blocks drains is a major factor causing flooding.

2.1.8. Strategic management of solid waste

2.1.8.1. Engaging an affordable mix of appropriate technical options to reduce, reuse, recycle and reject

The best method to deal with waste is centred on a broadly accepted 'hierarchy of west management' that gives a priority listing of the technical and sociological options of waste management available to the city authorities (MRGG, 2005). The hierarchy gives general guidelines on relative desirability of the various management options. It is also described that the way in which waste particularly solid waste can be managed via hierarchical arrangement of management options include prevention, minimization, reuse, recycling, energy/ recovery and disposal from descending to ascending order. See the following hierarchical arrangement.

Figure 2.1: hierarchy of integrated solid waste management



Source: MRGG, 2005

As shown on the hierarchy, the highest and most preferred rank of this management hierarchy is waste prevention or waste minimization at source, which aims at reducing the amounts of the waste produced. It also the most effective way to reduce the quantity of disposal waste, the cost associated with its handling and adverse environmental impacts. This is mostly the responsibility of house hold in domestic solid waste generation.

According to Zerayakob (2002), reuse, recycling and recovery are moderate technologies or ways in which waste can be managed in a case that reducing 'waste of waste'. It includes the process of the recovering materials with in the waste management system boundary and in most case is integrated in to the normal production process for the virgin material. It also stated that disposal or landfill is the least option of the hierarchy that involve controlled interment of the residual waste which has no further use on or in the earth's layer. Hence, the amount of waste quantity that needs to be transported at the landfill site is lower which result in lower transportation cost. Municipality emphasize the use of an affordable mix of appropriate technical and sociological options and thus depend solely on the conventional collection and disposal method (MRGG, 2005). These mixes of options include:

- Public education to enhance environmental awareness
- Creation of an environment friendly, eco-sensitive city/town
- Promotion of waste reduction at the source of generation
- Separation of waste at source of generation
- Return of recyclable materials to the market
- Composting and home-gardening
- Research in to anaerobic digestion
- Door to door collection of house hold waste
- Scientific handling of clinical and hazardous waste
- Set up 'polluter pays' system for special waste like demolition waste , hazardous waste, etc
- Sanitary landfill as the last resort

2.1.8.2. Involving the major stakeholders

As stated by Uwadiegwu and Chukuw (2013), to ensure effective solid waste management, the citizens must be mobilized via sensitization and environmental education. Sensitization brings about adequate citizen participation and private sector partnership. It means that the public agency cannot alone achieve success in waste management without corresponding positive collaboration of the citizens and other stakeholders. According to MRGG (2005), this strategy is built on the premise that solid waste management is not a mere public health engineering exercise. It requires the participation of every single resident and other user of the town/city facilities or any other stakeholders like NGOs, CBO, Private Enterprise, etc. It also stated the following various approaches to mobilize the public cooperation and support.

- Creation of Institutional mechanisms such as working groups and regular city consultations to involve the residents individually and collectively
- Conduct community based civic education programmes
- Setting up division level Environmental Management Committee (EMC)
- Setting up lane Committee for environment
- Publication of waste collection schedules
- Promotion of urban horticulture
- Recognition and facilitation of the private informal sector
- Engagement and facilitation of NGOs and CBOs

2.1.8.3. Promoting private-municipal partnerships

This strategy strongly hinges itself on partnerships between the municipality and private sector. It needs considerable potential for improvements in SWM performance through efficiencies gained from the introduction of private-municipal partnership (PPIAF, 2011). It also explained that privatization of environmental services will be done with cautious optimism ensuring the highest levels of transparency and promoting appropriately designed linkages with the informal service sector so as to prevent marginalization of the poor who currently depend on urban solid waste for their livelihood. Accordingly, this strategy promotes the following:

- Continued participation of private sector
- Street beautification through private sector participation
- Assistance to recycling industries
- Stricter environmental appraisal of construction plans
- Stricter fines for breaches of SWM contracts
- Incentive to private sector based on quarterly rapid environmental assessments
- Using the private sector as a thinking pad for municipality

2.1.8.4. Strengthening Institutional capacity

Institutional capacity is one of the determinants of effective solid waste management. Strengthening a public waste management agency requires a responsible government that committed to the cleanliness of the cities by beefing up the personnel strength of the agency, improving the circulation infrastructure and logistics (Uwadiegwu and Chukwu, 2013). As stated by MRGG (2005), municipality provide different facilities and guidelines by which

solid waste management tasks can be performed and it pursue the following to improve its institutional capacity to address SWM issues.

- Comprehensive environmental approach
- Non-negotiable emphasis on waste reduction
- Restructuring of municipal institutional arrangements
- Decentralization of municipal operations
- Capacity building for decentralized SWM
- Staff mobilization, training and education
- Strengthening the municipal standing Committee
- Improved public relations
- Formulation and follow up of a strategy implementation plan
- Prepare annual report on the status of city environment
- Improved management and monitoring

2.1.8.5. National and provincial level policy and programme support

The strategy help the central government with field lessons, views, comments and suggestions to regularly update the existing SWM policies and guidelines. The government pursue vigorously the program of poverty reduction as a way of addressing urban waste management problems and to ensure its sustainability (Uwadiegwu and Chukwu, 2013).

They also stated that the government find new technologies which are beyond the capacity of local body and continued support from the regional government to ensure the continuity of process-oriented initiatives such as Sustainable city/town programme and basic urban services are integral part of its solid waste management programme strategy.

2.1.8.6. Strict enforcement of laws and policy

It helps to implement the National strategy for solid waste management in a manner that suits the local conditions. According to MRGG (2005), municipality is expected to enforce laws and rules designed on solid waste management to ensure effective SWM; by building working groups/teams which can be assess the existing legal and administrative provisions that govern solid waste management in the city and propose appropriate revisions to make the frameworks more resident-friendly, efficient, speedy and pro-poor. As stated by Samuela (2011), in developing countries, non-compliance with the legislation is common due to lack of awareness and carefree attitudes. There is also limited human and financial capacity to

enforce the legislation with limited delegation of enforcement responsibilities among agencies. To improve this situation, the government is expected to provide training manual on the environmental protection and management to the stakeholders in order to ensure effective waste management particularly solid waste.

2.2. Empirical Literature

Empirical research is an indication of further researches conducted on the subject areas to confirm what was done with the progress. In other words, it helps to relate what is observed by different scholars and researchers about the specific area of study as evidence with the task currently performed or the study conducted with the new researcher.

In practice, the accumulation of evidence for against any particular theory involves planned research designs for the collection of empirical data and academic rigor plays larger part of judging the merits of research design. Accordingly, some of the key empirical studies are incorporated in the following table.

Table 2.1: The key empirical studies

Author	Years of study	Context or areas of study	Key findings
Degnet	2008	Determinants of solid waste disposal practices in urban areas of Ethiopia- A household analysis	The investigator analyzed the factors that can influence household SW disposal practices and concluded that age and family size are negatively influence the solid waste disposal practices whereas, sex (female), residence years and income of households positively affect the households' waste disposal practices. But education did not reduce illegal disposal practices. According to the finding of this study, more educated households are more likely to use open dumping than composting.
Ashenafi	2011	Determinants of effective household solid waste	The researcher analyzes the major factors such as demographic, socio-cultural and institutional factors that possibly have an

		management practice in case of Ambo town	impact over effective solid waste management at household level. He conclude that most of the demographic factors such as sex, educational level and income of the households have significant positive influence over effective household solid waste disposal practices in the study area. But household head age is negatively significant. The researcher also indicated that household's family size and years of stay are not significant or have not that much influence on effectiveness of HHSWM practice. According to this study, from the socio cultural factors location of the households has significantly negative impact on the subject area whereas, households' willingness to pay and awareness level are significant positive relationship with HHSWM. Finally, the researcher conclude that access of PWCs, law enforcement, human power, facilities and access of finance have positive effect over the effective solid waste management practice at household level.
Melaku	2008	Household solid waste generation rate and physical composition analysis in Jimma town	The researcher analyzes the existing solid waste management practices in the study area and concluded that the existing solid waste management experience in the town is investigated and it is found to be not environmentally friendly as the solid waste is disposed indiscriminately on open field and roadside. In addition to this the liquid and /or excreta collected from the town is also dumped everywhere, which has created additional health hazard and reduce aesthetic

			value of the town.
Dadso, A. Shaibu, I. and Godfred, S.	2013	Urban households' willingness to pay for improved solid waste disposal services in Kumasi metropolis, Ghana	He concluded that income, age, number of children, quantity of waste generated, and education have significant effects on the willingness to pay, while the amount of money the households are willing to pay was influenced by their income, quantity of waste generated, education, house ownership, and number of children.
Sreenivasan, J. Govindan, M. and Chinnasamy, M.	2012	Behavioural determinants of domestic solid waste minimization-a Malaysia Perspective	It is concluded that education, promotion, knowledge, awareness and reference group have positive impact on the intention to minimize waste which lead to a changed behaviour of individuals on waste minimization in Malaysia

Source: Authors

2.3. Conceptual frame work for analysis

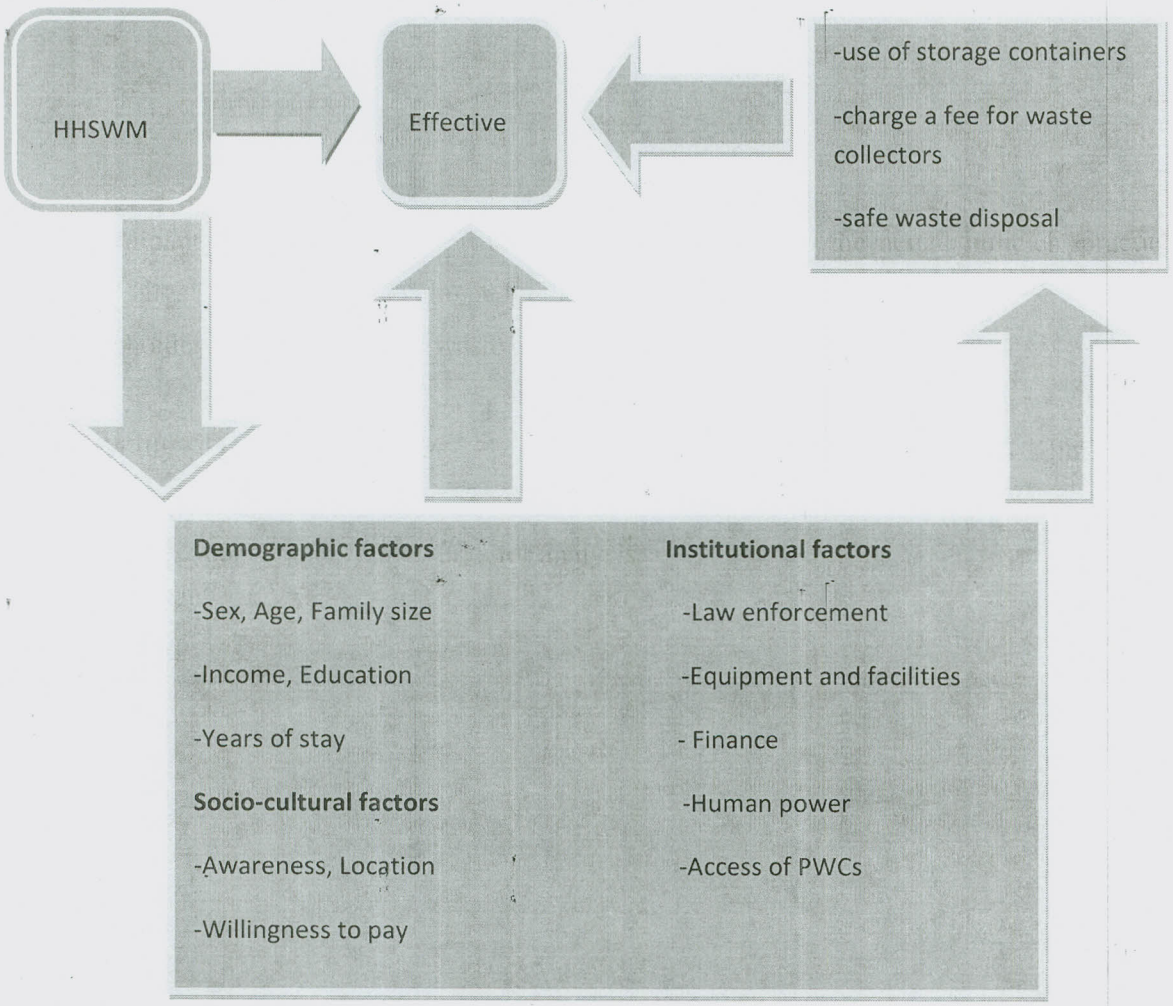
As mentioned earlier, solid waste has a process to be managed effectively. Moreover, it can be carried out with performing the primary collection, storage, treatment, transportation and final disposal at the regulated landfills or dump sites. These processes requires a potential commitment from the public, government and other stake holders like Private enterprises, NGOs, CBO, and others. However, the progress is highly complex. Because of the fact that sources are vary in nature; might be industrial waste, institutional waste, commercial waste and domestic waste. In addition, the management issue involves stake holders depend on their interest and attitudes except the government towards waste management particularly solid waste.

Moreover, these all and other activities towards solid waste management at all levels were discussed and seen in detail in literature review and some parts of this thesis. Based on this, the researcher has developed the conceptual frame work that was analysed mainly on solid waste management at house hold level. This frame work is indicated in colourfulness in which household solid waste management can be flow to be effective including the

determinant factors. This will provide a useful insight in to the actual policies, practices, procedures and strategies developed by the government at all levels and even to involve other stake holders to effective solid waste management at house hold level.

Generally, the conceptual frame work in which the scope of the study is delimited was developed by the investigator as follows.

Figure 2.2: conceptual frameworks for analysis



Source: Developed by researcher, 2014

CHAPTER THREE

3. RESEARCH DESIGN AND METHODOLOGY

3.1 Description of the study area

The study was conducted at Jimma town, which is one of the zones of the Ethiopian region of Oromia and located at 335 Km from Addis Ababa central of Ethiopia. Jimma is one of the biggest and dominant political, economic, cultural and historical towns in the southern part of the country, which has been founded the late 1830s. Jimma is locally known as the town of "Abba Jifar". Since then it has been the centre of most of the regimes administration and commercial activities. Geographically, the town is located at 7°41' N latitude and 36° 50' E longitudes (Municipality of Jimma town, 2009). According to the master plan of the town, the total area of land town is 4623 (46.23km^2) Hectares. The town is found at an average altitude of about 1,780 m above sea level. It lies in the climatic zone locally known as "WoynaDaga" (1,500-2,400 m above sea level) which is suitable for agriculture as well as human settlement. The town is generally characterized by warm climate with a mean annual maximum temperature of 30°C and a mean annual minimum temperature of 14°C. The mean annual rainfall in the town and its surrounding is ranges from 1138-1690 mm (Ibid).

Moreover, the population of Jimma town is estimated about 159, 009 (CSA, 2007) with annual population growth rate of 4.9%. Previously, the town had 21 kebeles, but now, it's merged in to 17 administrative kebeles after restructured by municipal government of the town. Now the town is being administered by mayor and has a status of zone administration and accountable directly to Oromia National Regional State. It has more than 27,000 legally registered houses and 379kms of its total length of road infrastructure; out this 29 km is Asphalt, 56km is gravel and 294km dry weather road. Street cleaning is done only on 16.8km Asphalt road with 20 people and the remaining one is left for uncollected solid waste (Melaku, 2008).

The data from the municipality of the town indicates that 25.7% of the total area is covered by residential buildings, 2.65% is commercial activities, 10.6% is social and public services, 2.6% is administrative zones, 15.4% is land reserved for constructions of roads and 39.1% is the land left for other infrastructures. From this point of view, many sources of solid wastes

are from residential houses which bring serious sanitary problems in the town. It is very common to see piles of waste on the streets, river banks, besides individual houses, available open areas and market areas. This indicates that one of the major problems of Jimma town is solid waste management (Lem Ethiopia, 2006; as cited by Melaku, 2008).

3.2 Rationale for the selected areas

In this study, Jimma is selected and thus, has a long history of urban service delivery, a Zonal city and seat for regional and international organizations having many economic and political functions. It is also one of the fast growing towns of the country. In other words, as the research conducted by Melaku (2008) depicts, the study area is where a serious problem of household solid waste management practices is took place and the people themselves have a little aware about effective solid waste management.

In these area (Jimma town), no research ever conducted so far on determinants of effective solid waste management practice at household level, and people have no more awareness about effective solid waste management as well as social and economic costs of ineffective and unsafe solid waste disposal in their destination (Abebe and Kebede, 1999). Due to the fact, we found so many people living in unsafe and hygienic environment. In some extent, private enterprise (private waste collectors) established to carry out waste pre-collection service, receiving payment either from the respective beneficiaries or municipalities to collect waste and transport to the municipal waste containers or waste disposal site, and helps to fill the created gaps in collecting and transporting wastes.

These enterprises represent a good starting point for building private sector participation and realizing the associated benefits. In contrary to this, due to the inadequate access of private sectors participation on solid waste management, currently the problem is getting worse and the people do not caring for environmental beautification, healthy and safety which can realize development and economic efficiency (Ibid). To solve this problem, the study aimed at analyzing and identifying the determinant factors that can ensure effective household solid waste management practice in Jimma town.

3.3 Research Design

The study was used both qualitative and quantitative research approaches to adopt a person-centred holistic and humanistic perspective to understand human lived experiences, feelings, preferences and opinions towards the subject area and emphasize the measurement and analysis of casual relationship between variables respectively. Holloway and Wheeler (2002) refer to qualitative research as "a form of social enquiry that focuses on the way people interpret and make sense of their experience and the world in which they live". A researcher was used the qualitative approach to explore the behaviour, perspectives, experiences and feelings of people regarding solid waste management practice at house hold level and emphasise the understanding of these elements. Burns and Grove (2003) also describe a qualitative approach as "a systematic subjective approach used to describe life experiences, opinions, feelings and situations to give them meaning" Whereas, quantitative research approach consists of those studies in which data concerned can be objective and analyzed in terms of numbers, and based more directly on its original plans and its results are more readily analyzed and interpreted (Best and Khan, 1989).

3.4 Research method

An explanatory research method was used to identify and understand the trait and mechanisms of the relationship and association between the independent and dependent variables. Accordingly, the method utilized to explain and test the trends and determinant factors influencing the effectiveness of household solid waste management practice in Jimma town.

The rationale of using this method is that explanatory research intended to explain or answer the question of why and how the phenomena (ineffective household solid waste management) can be occurs. Moreover, it enables a researcher to identify and explain the potential factors that can determine effective household solid waste management practice with the view to improving standard of care in the town.

3.4.1 Source and type of data

The study was utilized quantitative and qualitative type of data which constitute questionnaire, interview and focus group discussion respectively. In other words, both primary and secondary data sources were used. The primary data was collected from households, municipality, particularly city manager and private sector (private waste collectors) by using different instruments of data collection which include personally administered questionnaires, structured interview and focus group discussion respectively. In addition, secondary data was extracted from different sources including published and unpublished materials like journal articles, internet resources, Proclamation, books and other documents from administrative offices and municipality of the town.

3.4.2 Target population

According to Parahoo (1997) defines population as the total number of units, from which data can be collected, such as individuals, artefacts, events or organisations. Burns and Grove (2003) also describe population as all the elements that meet the criteria for inclusion in a study.

Jimma town is one of the reformed towns in Oromia region. It has city administration and seventeen independent kebeles. Permanent residents who are member of the town and legally licensed were considered as the population of the study area. Moreover, member of the municipality particularly city manager and private waste collectors were also included in data collection units through interview and focus group discussion respectively. However, these units (member of municipality and private waste collectors) were not considered as a population from which sample units could be drawn. Because, it's not necessarily important to sampling small (few) number of population rather than taking all of them. Accordingly, member of private waste collectors were few in number and also the interview prepared for municipality was answered by city manager due to the fact that the responsibility related questions or the concerned information is deliberately related to the top management (city manager).

3.4.3 Sample size

The researcher took a total sample size of 200 households from the given kebeles in general. It was decided by using scientific statistical method developed by (Cochran, 1977; cited by Melaku, 2008). The formula used for determining sample size was as follows:

$$n = \frac{NZ^2PQ}{d^2(N-1) + Z^2PQ}$$

Where:-

n = sample size of house hold units

N = Total number of housing units

Z = Standard normal deviation at the required confidence level that corresponds to 95% confidence interval equal to 1.96

P = Housing unit in percentage i.e. residential houses

Q = Non-residential houses like offices, schools, etc = 1-P

d (e) = The level of statistical significance (Allowable error 5% (0.05))

Accordingly, the sample size was determined using total number of housing units (N) 31, 060 and about 86% are residents (P) and the remaining 14% are non-residents (Jimma Town Municipality, 2007).

$$n = \frac{NZ^2PQ}{d^2(N-1) + Z^2PQ} = \frac{31,060(1.96)^2 * (0.86)(0.14)}{(0.05)^2(31,060) + (1.96)^2(0.86)(0.14)} = 185.47 \approx 186$$

Therefore, the minimum sample size (n) for this study was 186. Adjacent to this, 7.53% of 186 (14 households) are added for the unforeseen event to address the potential non response rate and invalid responses, making the number of the respondents 200. Finally, by using proportional allocation method, the researcher was decided to take 200 sample households from selected kebeles. These sample households were drawn for data collection using purposive sampling method.

3.4.4 Sampling techniques

In this study, multi-stage sampling was adopted to select the sample respondents from the given population. This sampling method was preferred to draw the representative sample units over the other methods. Given this, the researcher has clustered a number of administrative units or kebeles in to seven manageable clusters using their population density, economic status and geographical location as the defining variables. Then, a random sampling method was used to select one administrative unit or kebele from each cluster. Accordingly, seven kebeles namely Bosa Kito, Hermata Mentina, Jiren, Mendara Kochi, Bacho Bore, Hermata and Ginjo Gududru were selected as the sample units. See the following table.

Table 3.1: Total households selected as a sample

Cluster	Name of kebeles within the cluster	Number of kebeles with in the cluster	Selected kebele from the cluster	No. of selected household units
1	-Bosa Kito -BosaAddis Ketama - Ifa Bula	3	Bosa Kito	40
2	-Hermata Merkato -Hermata Mentina	2	Hermata Mentina	30
3	-Ginjo -Jiren -Haro Gibe	3	Jiren	25
4	-Saxo Samaro -Mendara Kochi	2	Mendara Kochi	40
5	-Bacho Bore -Qofe -Bore	3	Bacho Bore	20
6	-Mentina -Hermata	2	Hermata	25
7	-Hawetu Mandera -Ginjo Guduru	2	Ginjo Guduru	20
Total	7	17	7	200

Source: developed by researcher, 2014

Finally, as mentioned in the above table, 200 sample respondents were drawn from each kebele using purposive sampling method (i.e. non-probability sampling) based on the concentration or volume of solid wastes within the kebele particularly the area which has high volume of solid waste or in which high concentration of solid waste is found. The number households drawn from each kebele were determined based on its size. The respondent unit was the head of the house (husband or wife). In fact, purposive sampling technique is mostly appropriate to select the respondents because of the nature of the study and unavailability of the actual sampling frame of the permanent population living in Jimma town. In addition, purposive sampling is used to manage the time and other resources like simple random sampling. Generally, multi-stage sampling method is the best for this study to select the sample from household units in order to achieve the overall objective of the study.

4.4.5 Methods of data collection

To achieve the primary objective of the study, the investigator made desk review (review the related literatures) for secondary data from various sources which include published and unpublished materials like journal articles, internet resources, proclamation, books and other solid waste management related documents which is available in the library or administrative offices and municipality of the town.

Furthermore, to check and triangulate what is provided in the literature, a researcher was carried out a primary data collection from the respondents. Thus, data was gathered from the respondents and concerned bodies via various instruments of data collection. For gathering primary data, a researcher was used administered questionnaires (open and close ended), structured interviews and focus group discussion to look at HHSWM practice of the town and the responsibility of the concerned body particularly municipality together with performance of private waste collectors.

The questionnaires were prepared in English and translated in to local language in order to make it easily understandable to sample respondents. After preparation, some questionnaires were randomly distributed to correct unclear and misleading questions and then, all questionnaires distributed to samples with the help of data collectors under a close supervision of the researcher. Moreover, primary data was also gathered from municipality particularly head of municipality using the structured interviews to collect data which is difficult to obtain from the households, and also some data were gathered from the members of private waste collectors through focus group discussion.

To collect data properly, a researcher was recruited four enumerators who know the local language and training was given to them to make fast and easy the given task.

3.4.6 Methods of data processing and analysis

3.4.6.1 Data processing

After collecting data, data processing is essential part to check the consistency of the data gathered from different subjects so as to ensure the research validity. Yet, just as what goes on behind the scenes greatly contributes to the quality of stage research, data processing critically affects an investigator's ability to carry out reliable and valid investigation. Moreover, data processing methods employed by the investigator were includes data editing, coding, entry and cleaning in order to winnowing out the irrelevant from relevant and check whether data obtained is consistent or not.

3.4.6.2. Data analysis

Data analysis was commenced after conducting data collection via questionnaire, interview and focus group discussion. Both qualitative and quantitative techniques were used for data analysis. The qualitative method of analysis used for data that was collected through structured interview and focus group discussion from municipality (head) and members of private waste collectors respectively.

Quantitative method of analysis was also to analyse quantitative data which was collected from households via questionnaires. Data was analysed using both descriptive and inferential statistical tools. The main focus of the paper is to identify and analyze the determinants of effective household solid waste management practices. Thus, this section tried to outline the inferential statistics like chi-square and T-test to test the relationship between variables. Moreover, simple descriptive statistics like: frequency, percentage, mean and standard deviation were employed using table, bar graph and pi-chart in order to describe the present progress of household solid waste management practice in the town. Descriptive methods of analysis are very useful in describing and develop comprehensive understanding about house hold solid waste management activities and the negative impact of improper solid waste disposal on the life of the society. Accordingly, SPSS version 16 software was used to compute the descriptive and inferential statistics.

3.5 Ethical consideration

In collecting data successfully and smoothly, the researcher had had voluntary consent of the participants. In addition, showing respect for research participants and explaining the purpose of the study, the reason why they are selected and their responsibilities. Furthermore, the researcher was created a healthy rapport with respondents expressing that their responses are decisive for the successful accomplishment of the study. On top of that, the researcher also underlined that their responses is not be used for any other purposes except for academic purpose and remains confidential.

CHAPTER FOUR

4. RESULT AND DISCUSSION

4.1. Introduction

This chapter mainly focused on the major part of the paper which comprises result and discussion. This discussion is organized into sub-topics reflecting the research objectives and questions. The purpose is to simplify the discussion and contribute to a better understanding of a research finding. Moreover, this chapter aimed to present, analyse and interpret data gathered from households, municipality and private solid waste collectors using different methods of data analysis. The obtained data was analyzed using descriptive and inferential statistics. In addition to this, qualitative method of analysis particularly simple descriptive method was used to analysis qualitative data which was gathered through interview and focus group discussion.

4.2. Cotemporary situation of household solid waste management practice in Jimma town

The description of the current situation gives a clue regarding the existing situation of household solid waste management practice in the town in order to understand what is going on and try to make a way for a better and effective practice of the waste handling related issues. As researcher observed, the current situation of household solid waste disposal practice of Jimma town is worse. Solid wastes are dumped at illegal places such as road side, river side, in the gutters, near the bridges and open spaces as available. In addition, head of the municipality confirmed that household solid waste management practice is not effective as required. He also stated that most of the households use open spaces, river bank, drainage, road side, etc to dispose its solid wastes instead of using available public containers near to the residential areas or regulated dump sites. Furthermore, head also added that inadequacy of road infrastructure, lack of human power (technical and professional), financial constraints and other facilities such as shortage of public storage containers, transportation, etc are the major constraints that contributes to the problems of household solid waste disposal practices in the town. Due to this fact, the problem is becoming prevalent throughout the town. As a result, it contributes to great environmental pollution which can highly affect the life of the people and other animals.

As the actual world and personal observation indicates, terrible smell is the main feature of Jimma town as a whole. This is because of illegal solid waste disposal practice by households and little attention given by municipality to waste management as stated by the respondents. Gradually, it becomes serving as habitat formation for breeding insects and mosquitoes which brings infectious diseases on human health. This is also similar with what is found by Solomon (2006). He stated that illegally disposed solid wastes blocks drainage channels and increases stagnant water which serve to breed insects and mosquitoes.

As one of the environmental cleaning, cleaning house is very crucial activity among the household's tasks to handle the waste they possibly generate. Hence, the sample household heads were asked a question with regard to the frequency of cleaning their houses. Therefore, all of the respondents were replied as they clean their houses every day. It is obvious that wastes are generated per day in every house of householders that needs to be cleaned as per its source. However, the production of waste is depends on the income or consumption of the households. This is related with what Solomon (2006) stated as cited by Ashenafi (2011). He stated that the volume of solid waste generation is depends on the income of individuals or households. This implies that the consumption of certain product will increase along with the income of households which is emanated from numerous operations of economic activities undertaken. So forth, waste can be generated from such consumable products. Related to this, physical compositions of solid wastes regularly generated by households are various.

Household solid waste is heterogeneous mixture of products with different physical and chemical properties. It is matched with what is stated by Sarmeh, *et al* (2011) as cited by Dickson (2012). He stated that household solid waste composition are varies and depends on the nature of the products, the customs of the population and the quality of individual life style. Therefore, having knowledge of household solid waste composition is important because it would determine the management option when necessary. Accordingly, sample households were asked that what type of solid waste composition they frequently generate (see table 4.1 below).

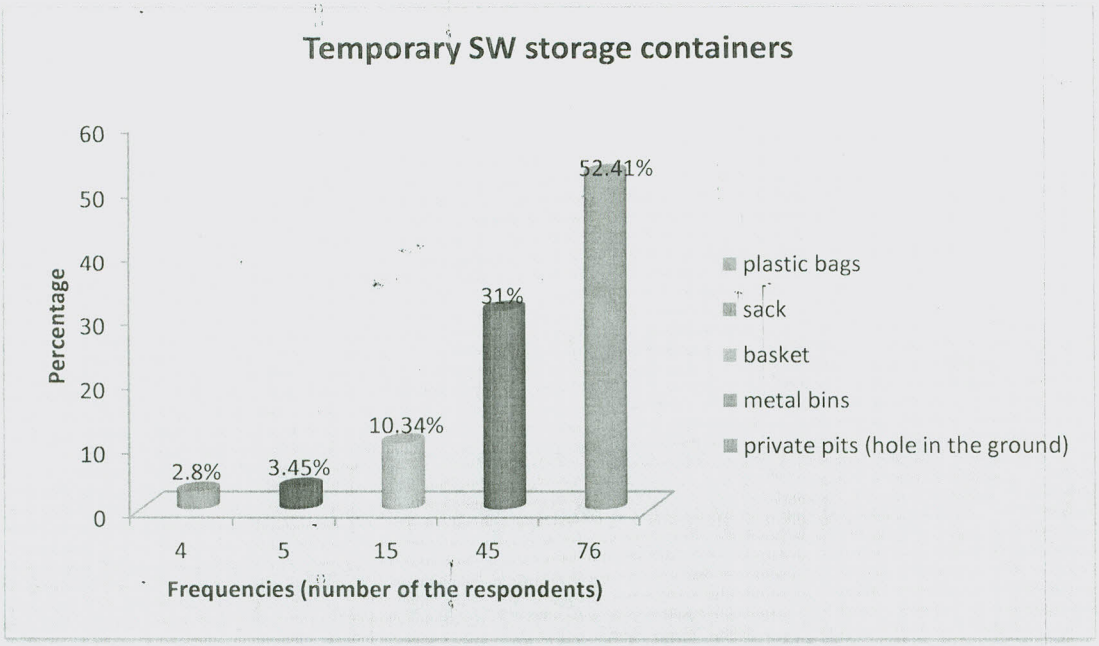
Table 4.1: Solid waste composition regularly generated at household level

Composition of solid waste	Frequency	Percent (%)	Cum. percent
Ash and dust	32	16	16
Food waste/left over	28	14	30
Paper and wood scrap	55	27.5	57.5
Plastic, old clothes & shoes, and leathers	60	30	87.5
Glasses, cans, ceramics & metals	25	12.5	100
Total	200	100	

Source: Survey result 2014

While responding to item of the above table, concerning to the composition of solid waste generated by households, 60 (30%) of the respondents usually generate plastic, old clothes, old shoes and leather wastes, while 55(27.5%), 32 (16%), 28 (14%) and 25 (12.5%) of the respondents frequently generate paper and wood scarp wastes, ash and dust, food waste (food left over), and glasses, cans, ceramics and metal scraps respectively. From this, one can understand that majority of the households (30%) regularly generate plastic, used clothes, used shoes and leather wastes in their houses. Even though households' wastes are differ in composition, its required to well and economically manage at source. To do this, using appropriate temporary storage container is the only and foremost way to handle solid waste either to dispose in to the available container or dumpsite or handover to the door to door solid waste collection service providers. With respect to this, the sample households were asked that what type of solid waste storage container they use (see figure 4.1 below).

Figure 4.1: Temporary solid waste storage containers used at household level



Source: Survey result 2014

With regard to the above figure, the sample respondents were asked whether they have temporary storage facility or not in their houses. Accordingly, a significant number of the respondents 145(72.5%) said that they have temporary storage container in their compound or houses where as the remaining percentage of the respondents 55(27.5%) dispose off their refuse illegally on the road, river bank, in drainage, open spaces and others (see table 4.2 under Appendix I). This is corresponding to what is found by Martin (2000). He stated that garbage that cannot be stored in the containers is illegally dumped off elsewhere or left to litter at curb sides. In the villages of Jimma town, littering or illegal dumping is quite common and normal because these areas are not served with adequate disposal facilities. As seen on the above figure, concerning to the type of temporary storage facility used by households, majority of the respondents (76(52.41%)) replied that they use plastic bags as a temporary storage container. But about 45(31.03%) of the respondents responded that they use sack to store their refuse. Similarly, 15(10.34%), 4(2.76%) and 5(3.45%) of the sample respondents replied that they use basket, private pit (hole in the ground) and metal bins respectively. This means that insignificant number of the respondents use basket, private pits and metal bins as compared with plastic bags and sack (see the figure 4.1 above). In addition to questionnaire survey, respondents orally added that they sometimes use plastic bags and sack at same time to cover all the solid wastes generated in their houses in order to keep

wastes awaiting for the service provider or dump off to the public containers other wise to the illegal places.

Moreover, its strongly recommended that households are expected to reuse the containers, but as per the question asked to the sample respondents, among the total number (145) of the sample householders who have temporary SW storage facilities, 110(75.9%) of the respondents responded that they need the containers back again to reuse or under regular follow up and place in their compound/surrounding whereas, the remained respondents 35(24.1%) did not reuse the containers under regular follow-up rather they have changed to the new storage containers through a time particularly those who use plastic bags and sack (see table 4.2 under Appendix I). As a researcher personal observation, it is also confirmed that some of the households either handover or throw out its temporary storage containers with solid wastes to the service providers (PE) or to the illegal sites.

In line with above issues, door to door solid waste collection service is very important from the generators point of view especially at the household level to ensure effective management of solid waste along with proper collection services. Hence, both private and public sectors are best institutes that deliver primary and secondary solid waste collection services to generators particularly households to protect human and environmental health. This is related with what is stated by Zurbrug (2003). He found that under the SW collection service providers, householders discharge their wastes at predetermined places having public storage facilities and collection vehicles collect the solid wastes at frequent intervals. Hence, the sample respondents were asked the question that do they have an access of door to door SW collection service provided with municipality of the town. Accordingly, all the respondents replied that have no such a service has been made or provided with municipality of the town. Because, there is no such a service at all as responded by all the sample householders following a question asked as the possible factor which was hindered them to have an access of the service. In relation to this, interview was made with head of municipality whether they have providing solid waste collection service to the households. In response, he confirmed that municipality has not delivering door to door solid waste collection service to the households rather transporting the accumulated wastes within the containers from each storage sites to the landfill (final disposal sites) using its own trucks and rent of private carts. The head added that the reason for the municipality did not give door to door waste collection service is incapacity of municipality to have access of sufficient equipment like transportation trucks to cover all the residential areas throughout the town.

This implies that the municipality of Jimma town has given low priority to the household solid waste collection service and even to other commercial sectors because of various factors particularly financial limitation to provide adequate transportation services and facilities such public containers, machines, etc. In addition, as a researcher personal observation indicates, most sections of the town in general and the selected areas in particular have been fully detected by the illegal solid waste disposal which brought the people living in hygienic and unsafe environment. This indicated that the municipality of the town confer little consideration to solid waste management in relation with other public services. It is similar with what is found by Nag (2005). He stated that the government give low attention to the importance of waste management as compared to other development issues like electricity, water supply, road, etc in developing countries.

In contrary, solid waste management law/proclamation No. 513/2007 of the country (Ethiopia) provoke that the responsibility of the municipal council is to ensure the solid waste management process in every community is effectively carried out. Street cleaning (litter picking, sweeping and cleaning of ablution facilities) should be done where and when ever necessary in order to give the environment a nice look. Nevertheless, this is not the case in Jimma town. As observed by the researcher, waste management particularly solid waste is irregular, deteriorate and ineffective in the study areas.

4.3. Determinant factors of effective household solid waste management: Descriptive analysis

Under this section, both quantitative and qualitative methods of analysis are used to examine and describe the relationship between explanatory variables and dependent variable respectively. In quantitative analysis, two statistical tools which include Pearson Chi-square(X^2)-test and two samples T-test are performed to analysis the relationship between independent variables (demographic, socio-cultural and institutional factors) and dependent variable (effectiveness) in general. Whereas, a number of the institutional factors such human power, budget and equipments/facilities were analyzed using qualitative method to describe its relation with effective household solid waste management.

4.3.1. Demographic factors

Demographic factors include sex, age, educational level, family size, years of stay and monthly income of households'. As mentioned above, these major factors were tested mainly using Chi-square test and T-test to pointed out its' relationship or association with dependent variable (effectiveness). Hence, simple descriptive statistics such as mean and standard deviation also applied to describe explanatory variables (see table 4.3 below).

Note: Sex of HH: 0 for female and 1 for male; Age of HH: 1 for 15-29yrs, 2 for 30-64yrs and 3 for ≥65 yrs; Edu of HH: 1 for prim.edu, 2 for sec.edu, 3 for certif., 4 for diploma, 5 for 1st degree, 6 for 2nd degree & above and 7 for no formal edu; Fsize of HH: 1 for ≤3, 2 for 4, 3 for 5, 4 for 6, 5 for 7 & 6 for ≥8; HH years of Stay: 1 for <6yrs, 2 for 6-10yrs, 3 for 11-20yrs and 4 for >20yrs; Distance from main road: 1 for <100m, 2 for 100-400m & 3 for >400m and Income of HH: 1 for <500birr, 2 for 500-1000birr, 3 for 1001-1500birr, 4 for 1501-2000birr and 5 for >2000birr.

Table 4.3: Descriptive Statistics for demographic characteristics of households

Variables	N	Mean	Std. Deviation	Minimum	Maximum
Sex of the HH	200	.52	.501	0	1
Age of the HH	200	1.82	.562	1	3
Educational level of HH	200	3.26	1.524	1	7
Family size of HH	200	2.53	1.421	1	6
Years of stay of HH	200	2.76	.947	1	4
Average monthly income of HH	200	3.97	.977	1	5

Source: Survey result 2014

A. Sex of the Household

As previously hypothesized, sex of household heads is fundamentally affect the proper way of household solid waste disposal practices in the study area. As the above survey result indicates, 52% of the sample households are male whereas the remained 48% of them are female headed households. Even though the number of male headed households is large in the sample units, the result of chi-square test indicates that significant percentage of the female headed households effectively manage its solid wastes as compared to male. This means that 55.56% and 44.44% of the female headed households and male headed households are managing its solid wastes in a proper way (effective) respectively. However, majority of the male headed households (58.18%) are ineffectively managing its solid wastes whereas average percentages of female households (41.82%) do the same thing (ineffective) (see Appendix II). Moreover, sex has significant relationship with the effectiveness of solid waste management practices at household level. In other words, sex (female headed household) is positively influence effective household solid waste management at 5% level of significance. It indicates that females are feeling more responsibility to keep their homes or compounds clean and health by disposing solid wastes in a proper ways as compared to males. This is related with what is found by Degnet (2008). He stated that female headed households are more likely to perform legal disposal practices or opted to burying or burning its solid wastes instead of dumping in the open spaces in relation to male headed households.

From this finding, one can understand that most of the households who are effectively managing its wastes are female headed households in Jimma town. Therefore, effective household solid waste management and sex of household head is highly related.

B. Age of the Household

As seen in table 4.3 above, the average mean of the household heads' age is 44.83 years. In relation to this, both groups of the household heads age are the same as the average means of the total household heads age. This means that the average mean of the effective and ineffective groups of households head age is similarly 44.83 years. This indicates that there is no gap between both effective and ineffective groups of households head age rather they are found in the same stage of years. Moreover, Moreover, the result of T-test shows that no significant relationship between household head age and effectiveness of household solid waste management at 5% level. This means that age of the household head has no effect over solid waste management at household level or it's not a determinant factor for effective household SWM in the study area (see Appendix III). It revealed that the effective and ineffective groups of households similarly found or nearly the same at all ranges of ages. This finding claimed that what is believed and confirmed by different researchers on the impact of household head age over proper ways of solid waste disposal practices in different areas of studies. Particularly Ashenafi (2011) found that household head age is negatively related with effective solid waste management practices at household level in the given area and the same is true for what is traditional viewed as old aged are not feel responsible to care for the environment rather assumed as the responsibility of the government. In contrary to this, this study found that both groups (effective and ineffective) of solid waste management are found on the same stage of age (44.83 years/adult stage). Therefore, it can be concluded as age of the household head has no more effect over effectiveness of household solid waste management.

C. Educational Level of Household

The households' educational level is one of the determinant factors that influence effective solid waste management at household level. As seen in the above table 4.3, the average mean of the households' educational level is 3.26. This indicates that most of the educational levels of sample households head are found between certificate and diploma levels.

Furthermore, educational level is tested using Chi-square test to prove the relationship between effective household solid waste management and educational level of household head. As a result, effective group of households' heads' educational level is found between diploma and master degree and above levels. In contrast, educational level of ineffective groups of households' heads is found between informal education and certificate levels. In percentage, 22.22%, 25.56% and 5.56% of the effective groups of household heads are diploma, first degree, and masters degree and above holders respectively whereas, 30.91%, 18.18%, 18.81% and 5.46% of the ineffective groups household heads are at certificate, primary, secondary and non-formal levels of education respectively. In short, 72.73% and 53.34% of the household heads who ineffectively and effectively managing its solid wastes are educationally found between informal education and certificate levels, and diploma and master's degree levels respectively (see Appendix II). This implies that there is a positive relationship between household heads' educational level and effective household solid waste management practices at 5% significance level in Jimma town.

Moreover, as the level of households' education increased, effective solid waste management also increased at same time and vice versa.

D. Family size of the Households

As stated earlier in the formulated hypothesis, family size has negative impact over proper way of solid waste disposal practices at household level. According to the household survey result in table 4.3 above, the average mean of the households' family size is 4.38. Based on the result obtained from statistical tool (T-test), there is a significant gap between family size of effective and ineffective groups of households in the study area. This means that the average mean of family the family size of households who are managing its solid wastes in effective way is 3.83. But the average mean of households' member who ineffectively managing its solid wastes is 5. In other words, households whose family size is large are disposing its solid wastes improperly as compared to small family size in the study area. Moreover, there is significant negative relationship between households' member and effective solid waste disposal practices at household level (see Appendix III). In relation to the above finding, many scholars and researchers believed that as the number of the households' members increase, the volume of the waste generated in the home/compound would be increased because of different product patterns consumed by the members of the households as per its income. As a result, they might be initiated to dump its solid wastes to unregulated places such as at open spaces, river and road sides, in the gutter, etc. One can

understand from this, as household family size increased, effective solid waste management would be decreased and vice versa.

E. Households' years of stay

The numbers of years that the resident stayed in the study areas have an effect over effectiveness of solid waste management at household level. As indicated in the above table 4.3, the average mean of the year that household heads stayed in the study area is 11.88 years. Moreover, the average years that effective and ineffective groups of households stayed in the residential areas are 14.83 and 11.75 years respectively. As the result of T-test indicates, there is positive and statistically significant relationship between the years that households stayed in a study areas and effective solid waste management at household level (Appendix III). This finding implies that as compared to long-existing dwellers, new dwellers are more likely to practice illegal solid waste disposal practices in Jimma town. Unlike new comer, the long stayed residents (households) mostly feeling responsibility to care for their environment by disposing its wastes at regulated sites through different means either use of private waste collectors or others.

F. Average monthly income of household

According to the survey result of the above table 4.3, the average mean of households' monthly income is 1667.33 birr. Similarly, the average mean of the households who experienced to manage its solid wastes in the effective and ineffective ways are 1667.33 and 1667 birr respectively. This implies that there is no mean difference of monthly income of the two groups of the households (effective and ineffective groups). In other words, the average level of households' monthly income with in both groups of householders is exactly the same.

Previously it was assumed that households' income has positive impact over the effective solid waste management but as the result of two samples T-test indicates, households' income and effective solid waste management are insignificantly related at 5% level in the study area (see Appendix III). This means that both household groups who are effectively and ineffectively managing its solid wastes earn the same level of income. Therefore, the level of income of the household head is not influence the effectiveness of household solid waste management in Jimma town.

4.3.2 Socio-cultural factors

This part is intended to analyze and describe the awareness and perceptions of the individuals (households) towards the importance and other related issues of solid waste management along with the location of the residential houses and willingness of the households to pay for solid waste collection services provided with the private waste collectors. Moreover, socio-cultural aspect is one of the major factors that can influence the effective solid waste management at household level. It is very essential to have knowledge and information about the ongoing activity of solid waste management and the possible inputs to address the solid waste related problems at the side of the households. This is significant and facilitate the local government bodies particularly municipality of the town or other concerned stakeholders in order to drive the new and leading systems of solid waste management and design the contemporary or modern ways of creating awareness, enabling condition up on the perceptions and attitudes of households as well as the problems related to road infrastructure and facilities.

A. Distance from the main road

Households' residential location is found to influence solid waste disposal practices. Moreover, a comparison is made between the location of households living area and effective solid waste management at household level. As clearly indicated in Appendix II, significant number of households (66.66%) who are effectively managing its solid wastes are living at the centre or near to the main road. But 44.55% of the ineffective group of households are found at the distant of greater than 400m far from the main road. Similarly, 17.27% and 7.78% of the ineffective and effective groups of households are residing at a distant of greater than 400m and less than 100m from the centre or near to the main road respectively.

This implies that the long distant of the residential area from the centre, the improper household solid waste disposal practices would be practiced in the study area. The result of Chi-square test also depicted that there is a negative significant relationship between the location of the household and the effective solid waste management at 5% level in the stud area (Appendix II).

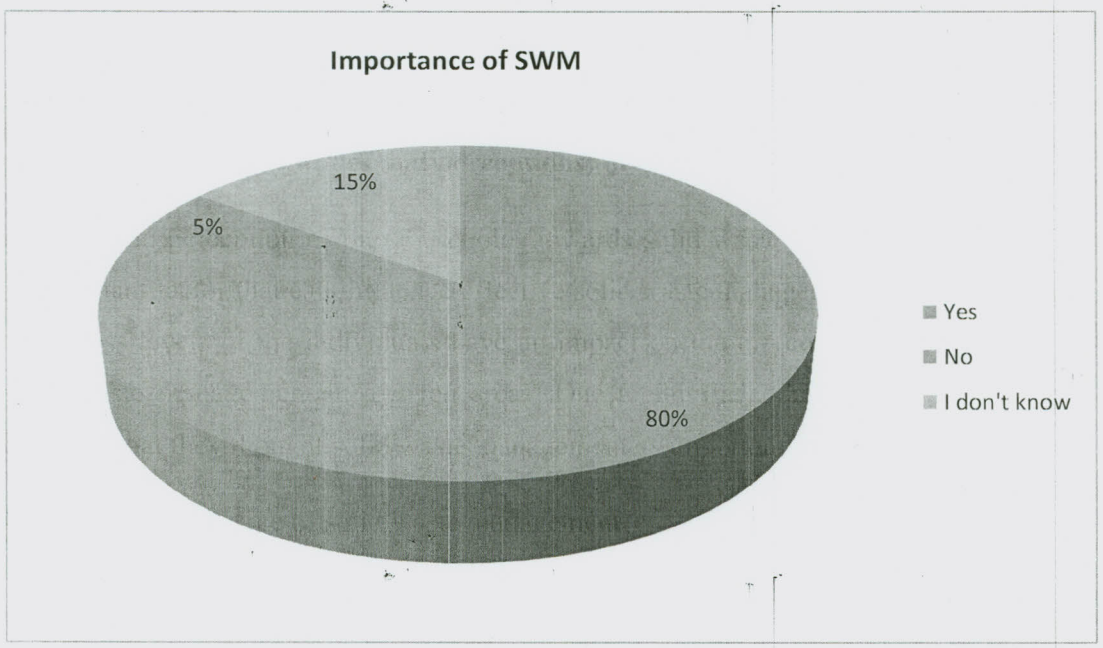
This finding implies that households who are far away from the centre have no access of solid waste collection services provided by the private waste collectors due to the fact that there are inadequate infrastructure (road) and facilities in the study area. Therefore, it was difficult to the households in order to handover its solid wastes to the private waste collectors at a distant

rather they enforced to dispose illegally without considering environmental health and sanitation. This is due to the fact that access of road infrastructure and public containers are the major problematic in the town.

B. Awareness (attitudes and perceptions) of household towards SWM

Attitude and perception of the households towards solid waste management is the expected determinant factor that can influence effective solid waste management in the study area. The awareness levels of the individuals have an impact on the effective way and importance of solid waste management in a given area. Due to this fact, the sample respondents were enquired that they thought solid waste management as important (see figure 4.2 below).

Figure 4.2: Importance of solid waste management



Source: Survey result 2014

As shown on the above figure 4.2, large number of the respondents revealed that they thought solid waste management is important. This means that a few number of the respondents (20%) had not awareness about the importance of solid waste management as a whole. In other words, 15% of them did not know whether solid waste management is significant or not whereas, 5% of the respondents believed that solid waste management is not vital rather it's a mere issue which has no effect. But 80% of the sample householders had been aware of and confirmed that solid waste management is as important as other public

services given by public administrators. This indicates, most of the residents of Jimma town are known of the effects of improper solid waste disposal in relation with human and environmental healthy.

This finding is further verified by the result of Chi-square test which indicates that all the effective group of the households confirmed that solid waste management is important. In contrary, 36.36% of the ineffective group of the households were believed that solid waste management is not important. Therefore, it's clear that awareness level of the households and effective solid waste management are positively significant relationship at 5% level (See Appendix II). This is corresponding with what is assured by Samuela (2011). He guaranteed that the need for further education and awareness creation is clearly evident by observing the perceptions of people, level of litter and illegal dumping in many urban areas.

Similarly, respondents were asked a question that does SWM is burning issue as compared with other public services. In contrary to the response of the above question regarding importance of SWM, less percentage of respondents (40%) reflected that SWM is a burning issue as compared to other public services like electric power supply, water supply, road services, etc. One can understand that a number of sample householders confirmed that consideration should be given to both SWM and other public services because they can affect the life of the society differently. But, significant percentage of respondents (60%) had no equal or same positive attitude towards the seriousness of SWM in relation with other public issues. This means that 46% of them were believed as SWM is not a serious issue relative to other services whereas 14% of them replied that they do not know whether SWM is burning issue or not (see table 4.4 under Appendix I). This indicates that majority of the people have not be seen the importance SWM and other public services in the same eye. As mentioned above, household awareness is yet low. Therefore, awareness level of the households towards the SWM needs to be improved through different means such as training and education.

However, as the result of questionnaire survey and a researcher personal observation in addition to actual world revealed that they are not discharging their responsibility particularly in consistent to clean their environment, manage waste at source using different storage facilities and disposing its refuses at legal places (dump sites) or public containers nearest to them or using private sector and other development institutions to transport litters to the final disposal sites (landfills) when necessary. It is most probably due to the fact that low level of awareness, lack of commitment and support from the local bodies to create better

environmental initiatives. This is basically essential to create good environmental image and atmosphere which is suitable to live and work in.

In addition to this, the basic importances' of solid waste management have been identified as per the response of the sample respondents. In view of that the percentage of the respondents (80%) those who were said 'Yes' (who believed the importance SWM) asked that what importance's of SWM are. Consequently, 50% of the respondents reflected that SWM is a key to control environmental pollution whereas 25% of them were replied that it avoids environmental degradation and associated problems. But, 12.5%, 7.5% and 5% of the respondents responded that SWM improve poor quality of land (sanitary landfills), avoids social and economic problems, and has economic value like recycling respectively (see table 4.4 under Appendix I). It implies that majority of the sample householders (50%) believed that SWM is a key to control environmental pollution followed by the second alternative (avoids environmental degradation) which is one cause of environmental pollution. The remained percentages of respondents were believed that the last three elements are relatively similar to the importance of SWM.

Therefore, it is vital to clean the environment either through the cooperation between/ among the neighbours reside in the same village or up on the predetermined program and or immediate action prepared and takes by either municipality of the town or within the given kebele's administration. Due to this, sample householders were asked that whether they engaged on environmental cleaning program in their village (see table 4.5 below).

Table 4.5: Households' Participation on environmental cleaning program

	Alternatives	Frequency	Percent (%)	Cum. percent
Item 1	Yes	60	30	30
	No	140	70	100
	Total	200	100	
Item 2	**Terms of participation on the program per year**	**Frequency**	**Percent (%)**	**Cum. percent**
	1 time	40	66.7	66.7
	2 times	20	33.3	100
	3 times	-	-	
	4 times	-	-	
	Others	-	-	
	Total	60	100	
Item 3	**Reason for not take part in the program**	**Frequency**	**Percent (%)**	**Cum. percent**
	No such program at all	96	68.6	68.6
	I'm busy	4	2.8	71.4
	It's unplanned/unprogrammed	40	28.6	100
	Others	-	-	
	Total	140	100	

Source: Survey result 2014

As seen on item 1 of the above table 4.5, regarding the question asked whether the sample householders engaged on environmental cleaning program in their village. From the total sample householders, 140(70%) of them replied that they never engaged on environmental cleaning program prepared by municipality in their village whereas, 60(30%) of the respondents reflected that they ever engaged on environmental cleaning program in a year. It implies that a significant number of the people or sample respondents were not took part in the program of cleaning their surrounding which most probably prepared by municipality or kebeles in a year particularly the last year.

As shown on the item 2 of the above table 4.5, from a number of sample households (60) who ever engaged on environmental cleaning program prepared in their village, 40 (66.7%) of the respondents reflected that they had been participated on environmental cleaning program one

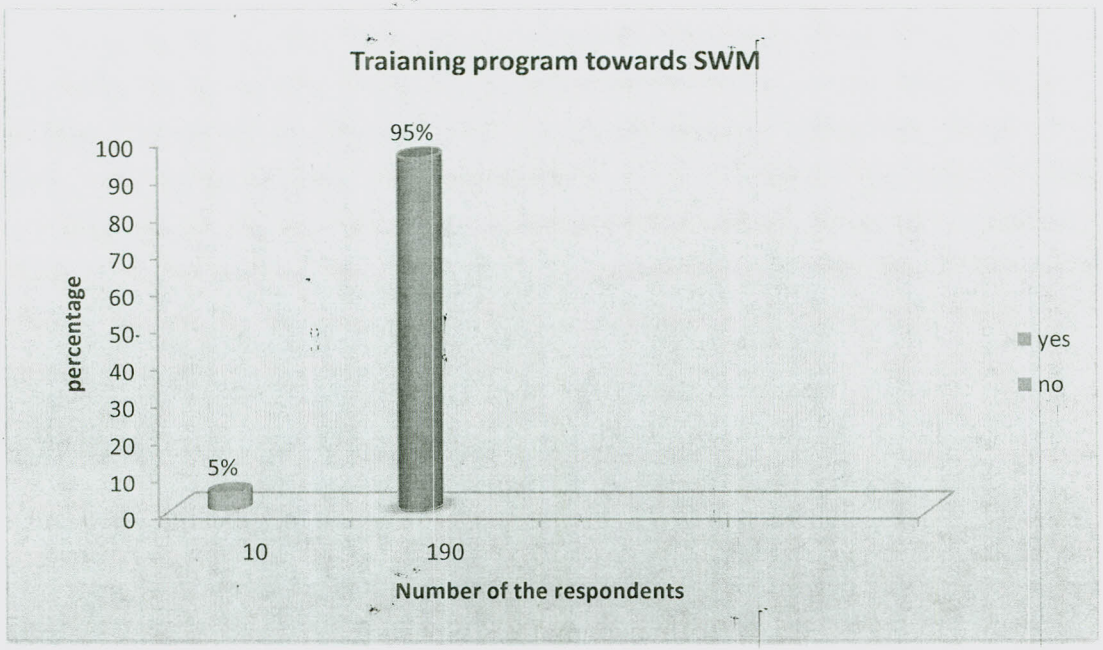
times a year particularly the last year while, 20(33.7%) of the sample householders responded that they ever engaged on the program two times a year. This indicated that majority of them were participated on the prepared program one time a year and some of them were engaged two times a year. This variability might be due to the fact that the interval in which the program (environmental cleaning program) prepared is different from village to village.

Regarding item 3 of the above table 4.5, those who never engaged on the program were indicated their reason while responded to the question that the factors which limited or hindered them to participate on the given program. As clearly seen on the table, from households who were not engaged on environmental cleaning program, a significant number of the sample householders 96(68.7%) reflected that no such a program at all in their villages. But some of the respondents 40(28.6%) responded that it was unplanned or non-programmed action so that they couldn't participated on it. In addition, few respondents 4(2.8%) said that they were busy so that they couldn't engaged in the program. As clearly mentioned above, the availability of the program and the situation of preparing or ways of letting the general public to the program might be different from kebele to kebele which could be made a gap in the town. To reduce this gap, the government is required to make the program equally important and consistent to all the parts of the town, and encourage the people to the environmental protection. To do this, it is essential to provide training and learning program on proper SW disposal practice in order to create awareness among the society. The major reasons for illegal disposal of solid waste of the residents are lack of adequate awareness about proper solid waste management system, cultural constraint which forces the society to give low emphasis to sustainable solid waste management and others.

To solve this trauma, awareness creation among the society through training and education program is fundamentally important.

Due to this fact, the sample householders were asked that whether they ever got training, education or any other information regarding SWM and the effects of improper waste disposal. The respondents were viewed as follows (see figure 4.3 below).

Figure 4.3: Availability of training program towards SWM at household level



Source: Survey result 2014

According to the survey result above, 95% of the respondents responded that they never got training, education or any other SWM related information and even about the effects of improper SWM. But insignificant number of the respondents (5%) replied that they got training and education on SWM and related issues. One can understand from this, the provision of training, education or information related to SWM is absolutely weak in Jimma town. Similarly, the head of municipality also asked the question whether the municipality ever provide teaching program to the general public particularly households towards the ways of managing solid wastes. He responded that no further teaching programs has taken or provided yet to the households except certain information might be given to a few villages with its respective kebeles towards solid waste management related issues because of the improper planning and technical problem of the concerned department particularly greenery and sanitation department to provide the program. The head also added that even if the program is provided, most of the households are not willing to participate on such program rather they needs to be enforced. Even though, by now, the municipality has planned to give priority to this issue in order to create a wide range of public awareness to improve solid waste management as a general and household solid waste management in particular.

Moreover, municipal administration provided poor information regarding the negative impacts of improper SWM on the environment and human life so that peoples were not hesitated to do an illegal waste disposal practice; because, they have little awareness about waste management and its impact. Besides, the respondents were also asked that whether they are interested to have learning program regarding SWM, environmental impacts of waste and different ways of reducing, treating and managing the waste stream. consequently, all the respondents were indicated their interest that they have been very need of learn about SWM and a variety of ways of treating, reducing and managing wastes. In addition, the respondents were also asked their choice of methods to receive education on SWM issues in order to increase their knowledge (see table 4.6 below).

Table 4.6: Household's choice of methods to receive learning program towards SWM

Favourite method to receive learning program	**Frequency**	**Percent (%)**	**Cum. percent**
Door to door education	13	6.5	6.5
Brochures distributed to residents	21	10.5	17
Open seminars	44	22	39
Teaching program through newsletter& magazines	7	3.5	42.5
Educational program in radio and television	31	15.5	58
Solid waste management eampaign	74	37	95
Exhibitions of presenting good practices in SW	10	5	100
Others	-	-	
Total	200	100	

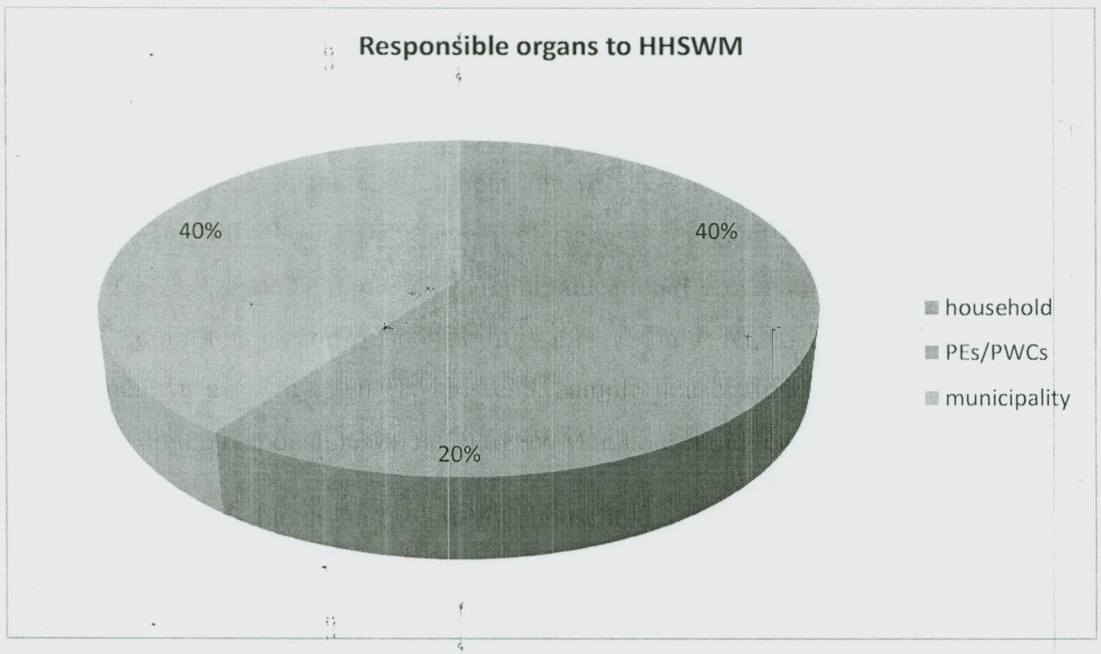
Source: Survey result 2014

As it is clearly observed in the above table 4.6, majority of households (74(37%)) believed that solid waste management campaign is paramount to provide education and information related to waste management whereas, (44(22%)) of the respondents confirmed that open seminars are relatively good to let the general public on short term education/training and learning program regarding ways of reducing, treating and generally managing solid waste generated in their compound and surrounding. Similarly, 31(15.5%), 21(10.5%), 13(6.5%),

10(5%) and 7(3.5%) replied that educational program via radio and TV, Brochures distributed to the residents, door to door education, exhibition of presenting good practices in SWM and teaching program via newsletters and magazines are the desired ways and methods to learn and acquire knowledge about SWM respectively.

One can understand from this, solid waste management campaign is highly important to provide knowledge to the public concerning waste management and the impact of improper solid waste disposal on the environment and people's life. In other words, the methods to receive education by those respondents preferred are dominantly on solid waste management campaign (37%), open seminars (22%) and educational program via TV and radio (15.5%). In fact, commitment and responsibility are required to ensure effective solid waste management in a given town. To this end, sample households were required to give their perception on the responsible organ (s) to SWM at household level (see figure 4.4 below).

Figure 4.4: Responsible organs to SWM at household level



Source: Survey result 2014

According to the survey result on the above figure, household and municipality are highly responsible to solid waste management at household level. This means that 40% of respondents replied that household is responsible to manage solid waste generated in its house especially at source by using different storage facilities and keeping the waste in a safe and healthy ways until the final disposal.

The same is true for municipality, which means 40% of the households also confirmed that municipality is responsible to awareness creation among the society regarding ways and systems of waste handling and provide various facilities and infrastructures necessarily used for solid waste management like public containers, wheel carts, building roads as well as initiating other stakeholders such as PEs, NGOs and CBO to participate together on solid waste management particularly establish integrated solid waste management. In addition, municipality is also responsible to make consistent follow up to the progression of household solid waste disposal practices through kebeles' administrators all over the town.

Similarly, 20% of the respondents believed that PEs is responsible to manage solid waste at household level. Private waste collectors are one of the stake holders deliver door to door solid waste collection service to the households in a given area (town). Due to this fact, they are responsible to do their work or provide effective services to the society by fulfilling the required facilities and equipments. The above figure clearly showed that significant number of the respondents preferred that household and municipality are basically responsible to handle the waste generated at household level in general. Even though the level of percentages that respondents indicated on the responsibility of the three organs to SWM is various, all organs are primarily in charge to manage the wastes particularly solid waste which is generated at household level so as to protect the environment they are living and working in. Related to this, solid waste requires different ways to be managed well. Thus, it's very crucial to develop various approaches and ways to improve solid waste management particularly at household level. For this reason, sample respondents were asked that the important ways to improve SWM do they think (see table 4.7 below).

Table 4.7: Important ways to improve SWM at household level

Ways to improve SWM	Frequency	Percent (%)	Cum. percent
Payment of fees for collection	88	44	44
Provision of designated dumping sites	33	16.5	60.5
Provide massive educational/awareness campaigns	52	26	86.5
Building cooperation among residents/neighbours	10	5	91.5
Fine punishment for discriminate or unsafe disposal	17	8.5	100
Others	-	-	
Total	200	100	

Source: Survey result 2014

As per the given data above, from 200 households 88 (44%) of the respondents reflected that payment of fees for collection service is the important way to improve solid waste management whereas, 52(26%) of the respondents stated that provision of massive education or awareness campaign to households can improve solid waste management. In addition, 33(16.5%), 17(8.5%) and 10(5%) of the sample householders replied that provision of designated dumping sites, fine punishment for discriminate or illegal disposal practices and building cooperation among residents are essential ways to improve SWM respectively.

It's clearly showed, majority of the respondents confirmed that charge for collection service followed by massive education preferred to indispensable ways to improve and upgrade solid waste management in Jimma town. Similarly, provision of designated dump site is also relatively important to do the same thing. As mentioned above, municipality is responsible to provide massive education in order to create awareness among the society on the top of ways to manage solid waste generated at home; especially how the households separately store solid wastes at source and other related issues.

Practicing this type of activity is very important to waste generators as well as municipality since it minimizes cost of disposal, generates revenue, and prolongs lifespan of disposal site. This is one of the reasons why solid waste managers in many parts of the world are now exploring ways to reduce flow of biodegradable and recyclable materials to landfill sites.

However, in the case of Jimma town such activity is found at a very grass root level without significant progress. Due to this fact, sample households were asked that whether they have trend to separately store SW generated at their home (see table 4. 8 below).

Table 4.8: Trend to separate solid wastes at household level

Item	Have a trend of separately store SWs	Frequency	Percent (%)	Cum. percent
Item 1	Yes	122	61	61
	No	78	39	100
	Total	200	100	
Item 2	**Type of SW separating**	**Frequency**	**Percent (%)**	**Cum. percent**
	Used papers	10	8.2	8.2
	Plastic materials	63	51.64	59.84
	Glass materials	5	4.1	63.94
	Metallic materials	8	6.56	70.5
	Textiles, leathers, and other similar wastes	26	21.3	91.8
	Food left over	6	4.92	96.72
	Spoiled vegetables and animals shit	4	3.28	100
	Others	-	-	
	Total	122	100	
Item 3	**The reason for separating SWs**	**Frequency**	**Percent (%)**	**Cum. percent**
	To reuse	10	8.2	8.2
	To feeding domestic animals	5	4.1	12.3
	To give for other users like 'liwach'	95	77.87	90.17
	To use for fertilizer	3	2.45	92.62
	To make fuel and use in home like 'biogas'	-	-	-
	To burn separately in the compound or at road side	5	4.1	96.72
	To give to private waste collectors	4	3.28	100
	Others	-	-	
	Total	122	100	

Source: Survey result 2014

Under the item 1 of the above table, a significant number of the households have been separately stored solid wastes generated in their home. This means that from the total sample households (200), 122(61%) of the respondents separately stored solid wastes generated based on its composition. But the average of the respondents 78(39%) stated that they did not apply solid waste separation in their home. One can understand that those households who were not applied solid waste separation have basically lack of information or no awareness and knowledge about the importance and consequence of SW separation and gave little attention or worth to the economic values of waste materials. Therefore, these households have been stored solid wastes as they want or in combined without considering the nature and values of wastes. This indicates that the more awareness the effective solid waste management would be accomplished.

The sample households who apply solid waste separation also fixed their experience on type of solid waste they separate or how they separate wastes. Likewise, the above survey result (under item 2) indicates that the leading households' solid waste separation activities in the town is only solid wastes that are sellable and exchangeable materials to "Quraleos" and "Liwach", and to some extent organic wastes are also separated. Hence, from those households who apply solid waste separation, the response of sample households also shows that about 102(83.6%) of them are separately store solid wastes which are sellable to "Quraleos" and exchangeable with "Liwach". According to those respondents the dominant types of such wastes include; plastic materials 63(51.64%), textile, leather (old shoes) and other similar wastes 26 (21.3 %), metallic materials (like cans & others) 8 (6.56%) and glasses (like bottles) 5 (4.1 %). To some extent, organic wastes which have been separately stored like used papers 10 (8.2%), food left over 6(4.92%), and spoiled vegetables and animal shits 4(3.28%) are low in average as compared to sellable materials. Moreover, households' awareness about usefulness of such discarded wastes for "Quraleos" and "Liwach" together with their low economic performance led households to separately store such wastes and generate income and new equipments to their house.

The respondents who apply solid waste separation were also asked the purpose for they separately store the wastes based on their nature (see item 3 of table 4.8). In response to this, significant percentage of the sample households (77.87%) practiced solid waste separation for selling and exchanging purpose like "Quraleos" and "Liwach". But the remained percentage of them used separation activities for other purposes such as reuse (8.2%), feeding domestic animals (4.1%), burn separately in the compound or at road side (4.1%), hand over to PWCs

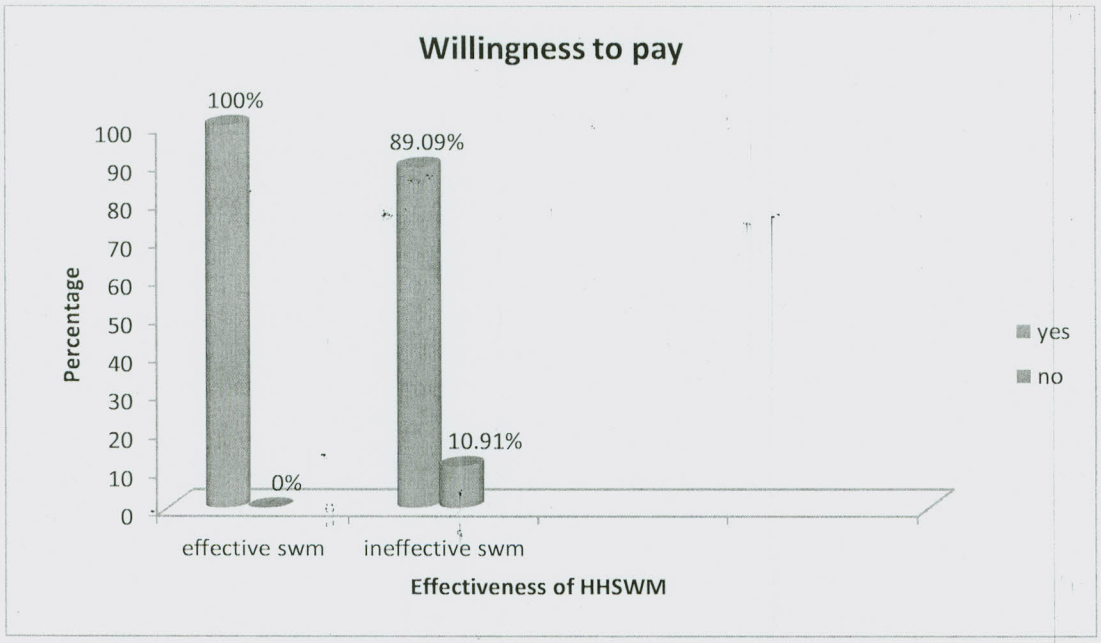
(3.28%) and used for fertilizers (2.45%). From this finding, one can understand that plastic materials, glasses, metallic materials, textiles and leathers (shoes) are saleable and exchangeable materials. Whereas, all organic materials like used paper and some plastic materials, food left over, spoiled vegetables and animal shits are reused (as toilet paper) or burn separately, used for feeding domestic animals, fertilizers and give to PWCs respectively.

Furthermore, the understanding level of households and effective ways of solid waste management has positive relationship as indicated by the chi-square test on Appendix II. Therefore, the higher the understanding level of the householders, the effective waste management would be achieved.

C. Willingness to pay

Households' willingness to pay for the solid waste collection service is one of the influential factors of the effective solid waste management practice. Due to this, households were asked the question that they are willingness to pay for door to door solid waste collection services (see figure 4.5 below).

Figure 4.5: Willingness of households to pay for PWCs



Source: Survey result 2014

As the above survey result shows, all of the householders who effectively managing its solid wastes were interested to pay for the service provided with private waste collectors whereas, 89.09% of the ineffective group of the households were willing to pay for the solid waste collection service. But 9.09% of the ineffective group of the householders were not willing to pay for solid waste collection service (see the above figure 4.5). Moreover, there is a gap between both groups towards willingness to pay for waste collection service which shows that the effective groups are better of managing its solid wastes effectively with having interest to pay for the service delivery in relation to ineffective group. Those who are not willing to charge for the service might be consider their economic status or may take solid waste management at household level is mainly the responsibility of the municipal administration. Furthermore, Pearson Chi-square test also indicated that there is positive relationship between households' willingness to pay for proper solid waste disposal and effective household solid waste management at 5% level (see Appendix II).

4.3.3. Institutional factors

Institutional aspects are other factors that highly influence the effectiveness of household solid waste management in the study area. These include access of private waste collectors, law enforcement, facilities and equipments, human power and budget.

A. Access of private waste collectors

The adverse impacts of waste management are best addressed by establishing integrated waste management systems where all types of waste and all facets of the waste management process are considered together. Moreover, municipality is responsible to build technical, financial and administrative capacity to manage and sustain it. Even though municipality has the responsibility of providing public services particularly waste management , it's difficult to the government alone to achieve effective waste management without the involvement of various stake holders like PEs, individuals/households, donor agency, NGOs and CBOs in a given area. Among these stakeholders, private sector is one of the most important organs which reduce the burden from the government by providing various services particularly solid waste disposal services to the community.

This is related with what is found by Dickson (2012). He stated that private sector participation in urban services particularly waste management can reduce the cost of public services to consumers; relieve the financial and administrative burden on the government; increase productivity and efficiency by promoting competition; stimulate the adoption of

innovation and new technology; improve the maintenance of equipment; and create greater environmental changes. In addition, Yami (19990 stated that some of the activities of the government can be carried out by the private sector with a reduced cost, due to minimized overhead and running costs. So the government should delegate or contract out some of its responsibilities to private partners and should prepare the ground to work with others.

According to the interview made with head of municipality, currently the labour force for waste management in Jimma town is inadequate – street sweepers, service men in the collection and transportation department as well as those involved in landfill operations are inadequate, and this has rendered the waste management system to be ineffective. Similarly, the sample householders were asked that do they know the existence of PWCs in Jimma town. Consequently, majority of the respondents (165(82.5%)) confirmed that they know existence of regulated private waste collectors in the town. But small number of households (35(17.5%)) viewed that they do not know whether PEs are existed or not (see table 4.9 under Appendix I).

As stated above, the involvement of various stakeholders' particularly non-profit organization such as NGOs and CBOs in public issues like solid waste management have become very important. Because, they are one of the development actors which support and enable the government to protect the environment in order to ensure sustainable development of one country. Due to this, the respondents were asked that whether they know any non- profit organizations like NGOs and CBOs working on or providing sponsorship for SWM in Jimma town. In response to this, all the respondents confirmed that no NGO or CBO working on or sponsoring solid waste management is found in the town. Like the response of the respondents, head of the municipality also replied that they had no non-governmental sponsorship in general. From this, one can understand that no enabling condition and initiation are made beside of the government particularly municipality of the town for NGOs and others. The municipality has also not designed the mechanism to accommodate and integrate partnership, and cooperation with these non profit organizations. This negatively influences the effective solid waste management because of the fact that it might be difficult for government to finance the assignment since it requires huge amount of capital to do so. The result of the interview made with the municipality of the town particularly the head indicates the same response with the sample households about the absence of non-profit organizations. Moreover, low promotion is made with the concerned body (Green and sanitation department) about the existence and service provided with private enterprise.

As a result, households were not well informed to use the private waste collectors in order to dispose its refuses or wastes to the proper and regulated dumping site. In addition to this, sample households were also asked that they have an access of door to door SW collection service provided by PWCs and the interval in which the service is rendered in a month (see table 4.10 below).

Table 4.10: Door to door SW collection service provided with PEs

Use of SW collection service given by PEs	**Interval of getting service in a month**					**Total**
Yes	2times/ week	1time/week	2times/month	1time/ month	As available	140(70%)
No	-	140(100%)	-	-	-	60(30%)
Total	-	140(100%)	-	-	-	200(100%)

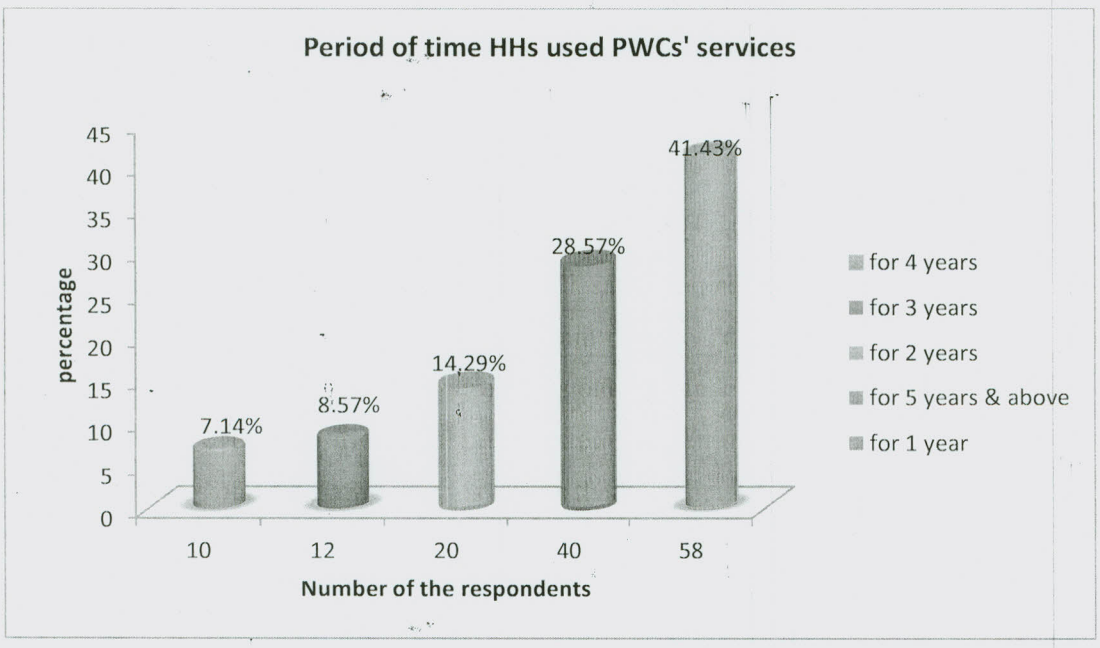
Source: Survey result 2014

As depicted in the above table, majority of the respondents have an access of door to door solid waste collection service provided by private sector but small numbers of households do not have it. This means that from total sample households, 140(70%) of the households revealed that they have access of private waste collectors whereas 60(30%) of them responded that they do not have access of PWCs to dispose sold wastes generated in their home. Households who have an access of PWCs paid for the service about 10- 20 Ethiopian birr based on the volume of the solid waste. In addition, those households who have no access of private waste collectors were limited by certain factors. For this reason, households were asked that what are the factors hindered them to use the service. In response to this, significant number of the respondents (40(66.5%)) were unable to have an access of PWCs due to the fact that the distance of their home or village from the main road is far away. But the remained percentage of the households (7(12%)) confirmed that no such services at all and some of them (8(13.3%)) also revealed that they were unable to pay for the service (see table 4.11 under Appendix I). From this finding, one can understand that there is inadequate infrastructural services particularly road in the sections of the town and low awareness of households as well as poor promotion on the existence and services given by private enterprise/PWCs.

As indicated by the result of Ch-square test earlier, there is a significant relationship between location (distance from the main road) of households and access of private waste collectors. Furthermore, the statistical test using Chi-square confirmed that access of PWCs and effective solid waste management are highly related or they have significant positive relationship at 5% level (Appendix II). This implies that all the households who manage its solid wastes in effective manner have access of private solid waste collectors whereas, 45.45% of the households who manage its solid wastes ineffectively have an access of private waste collectors. But average percentage (54.55%) of the ineffective group of the households has no access of solid waste collection service in Jimma town (see Appendix II). Moreover, those households who have an access of PWCs but ineffective are one of the group who carried out illegal disposal practices particularly when the service given with waste collectors is interrupted because of various factors such as truck breakdown or when the service provider delay (not come on time or on the fixed day).

Therefore, access of private waste collectors and effective household solid waste management are strongly related. Beside, all sample households who have an access of private waste collectors replied that they obtain door to door solid waste collection service one per week (see table 4.10 above). From this one can understand that households store solid wastes at source using various temporary storage facilities and handover to the private enterprise/PWCs one time a week. This means that they get the service four times in a month.

Figure 4.6: Duration of time that households used service provided with PWCs



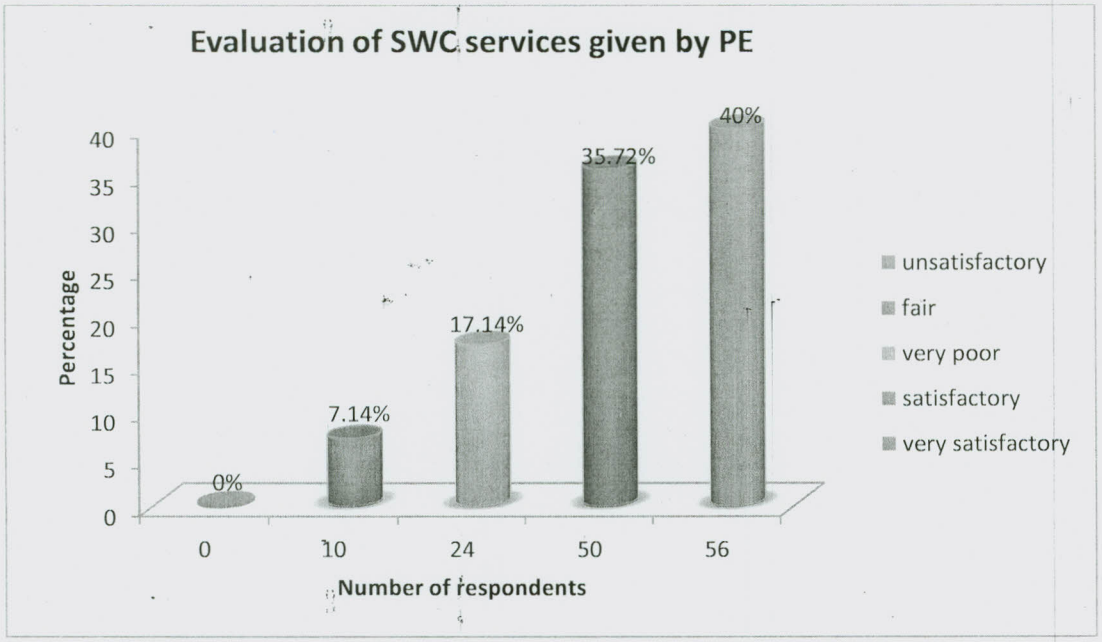
Source: Survey result 2014

As shown on the above figure, small percentage of household (8.57%) has been used PE/PWCs for a long year to dispose solid waste generated in their home. But a significant numbers of sample households were the recent users of PWCs. This means that 41.43%, 28.57%, 14.29% and 7.14% of the respondents revealed that they have been used for 4, 3, 2, and 1 years respectively. One can understand that households were carried out illegal solid waste disposal practices such as at road sides, open spaces, river side's (near the bridges), in gutters, etc before these years. Moreover, most of the households are a short period experienced of using door to door solid waste collection service provided by private sector. This indicates that the local bodies mainly municipality did not perform the preparatory work on the behalf of the households. Therefore, it's undeniable that promotion should be made to encourage and initiate the service users particularly households in order to create awareness about the importance of PEs and alert them to use the service.

Furthermore, evaluating the quality and extent of service rendered by PE is essential task to the municipality in line with the attitudes and suggestions of households towards the service provided. Similarly, households are also expected to weigh up the service provider on the main issues related to impartiality, commitment, time, capacity, etc on the given service.

In line with this, the sample households were asked the question that how they rate the activity of PE on door to door solid waste collection service (see figure 4.7 below).

Figure 4.7: Rate of waste collection service provided with PWCs at household level



Source: Survey result 2014

According to the above survey result, among the respondents who have an access of PWCs, significant percentage of the households are not satisfied or unsatisfied with PWCs over the service provided to them. But averages of the households are moderately satisfied with it. This means that 57.14% of the respondents confirmed that they are unsatisfied with the PE; specifically, 40% and 17.14% of the households are viewed that the service provided via PE is unsatisfied and very poor respectively. In contrary, 42.86% of the sample households replied that they are moderately satisfied with the service provider; in particular,35.72% and 7.14% of them responded that the service rendered with PE is not enough but fair and satisfactory respectively.

From this finding, one can understand that the quality and extent of service provided with PE/PWCs to the households is currently regrettable. This is because of different factors emerged beside the private enterprise and the government bodies especially municipality. Along with this, the householders who confirmed that the service delivering with PE is unsatisfactory & very poor were asked that the factors or reasons for unsatisfactory and poorness of the services (see table 4.12 under Appendix I).

As illustrated on the survey result, there are major problems of infrastructure and facilities such as road, truck, wheel cart, and others beside of the local bodies and PEs in Jimma town. Similarly, commitment problem is also one of the factors that underweight the status of private waste collectors. These are clearly stated with the response of the sample householders. Thus, 62.5% of respondents stated that lack of adequate facilities like trucks, wheel carts and others hindered the efficiency and effectiveness of the PE which directly affect the service delivery (see table 4.12). In the same way, 18.75% and 12.5% of the sample households revealed that lack of infrastructure like road and poor commitment beside of PE are one of the reasons that diminished the quality and extent of the service delivery in the town respectively. In despite of this, 3.75% and 2.5% of the respondents believed that shortage of human power and gap of collection interval are one of the reasons of the problem respectively.

In relation to the above finding, private waste collectors needs to be encouraged and given training and education programs to improve its capacity to provide the service to the general public in a well manner. As result of interview made with head of municipality indicates, the municipality especially the Green and Sanitation department have encouraged the private waste collectors (MSSEs) providing them with certain facilities mainly Trucks and storage containers. He also added that municipality has prepared training and education program for PWCs one times a year. Similarly, sometimes municipality have a call for PWCs for open meeting and discussions on various issues of solid waste management including how to dispose solid wastes, ways to treat the customers (households), efficient use of resources and over all the importance of effective solid waste disposal practices in the study area. However, head also confirmed that the provision of solid waste related training and education is not sufficiently provided to the private waste collectors so that it needs further improvement.

From this finding, one can understand that human power and collection interval are not considerably the problem of private enterprise. But infrastructure (road), facilities (such as trucks, wheel carts, etc and low commitment of the private participants are main problems of the service delivery. Low level of municipal encouragement and the provision of solid waste related training and education program to the PEs are one of the factors which slow the service delivery.

Households are primarily keeping its refuses or solid wastes generated in their compound/home with their temporary storage facilities until the service provider particularly private enterprises comes back on the specified day and time otherwise they dump off at everywhere else (illegal places). Due to this fact, sample households were asked that how they keep solid wastes until the PEs revisit at the specified day and time or if they late or absent (see table 4.13 below).

Table 4.13: Households' choice of ways to keep SW until PWCs revisit

Means to keep SW till service providers return	**Frequency**	**Percent (%)**	**Cum. percent**
Keep in home with temporary storage containers	90	64.29	64.29
Throw out to the open space in their village	10	7.14	71.43
Burn at the road side	20	14.29	85.72
Collect in the compound on open space/free space	-	-	
Collect in the kitchen	8	5.71	91.43
Dump in the gutter	12	8.57	100
Others	-	-	
Total	140	100	

Source: Survey result 2014

As shown in the above table, significant numbers of the households keep its refuses or solid wastes generated in their compound/home with temporary storage containers and handover to private waste collectors while they revisited on a week round or probably on the second week round (if they are absent). But average of the households have not been kept solid wastes with temporary storage facilities when the PE absent or late rather they dumping off at an authorized locations such as at open spaces, road sides, in the gutter and burn at the road sides. This means that from the total number of the respondents who have access of PE, 90(64.29%) of them confirmed that they keep solid wastes generated in their compound using temporary storage facilities until private waste collectors come back or even if they are not come on time/delay or absent. In despite of this, 42(30%) of the respondents reflected that they do not keep solid wastes with temporary storage containers if the PWCs late or absent rather they dispose off at unregulated locations. In other words, 20(14.29%), 12(8.57%) and 10(7.14%) of the respondents responded that they burn their refuses or solid wastes at road sides, dump in the gutter and throw out to the open space in their villages respectively.

But small number of the respondents (8(5.71%)) have been collected its solid wastes in their kitchen. This finding indicated that even if the PWCs come on time/late or absent, most of the service users (households) of Jimma town keep its solid wastes with the temporary storage containers.

However, an average or a number of households keep solid wastes generated in their homes/compounds with temporary storage facilities if and only if the PWCs come on the specified day and time. Otherwise they carry out an illegal disposal practices which adversely affect environmental and human health.

In addition, apart from the utilization of solid waste collection services provided with the private enterprises, individual households dump off solid wastes in to different locations of the town. This may include some range of solid waste composition or the waste generated per a day without managing at source or store in temporary storage containers so as to transfer in to the public containers and trucks if it's available. This illegal practice creates unhygienic and hazardous environment which ultimately affect the socio-economic aspects of the country. Accordingly, the sample households were asked that other means they always used to dispose solid waste generated apart from the service provided by PEs (see table 4.14 under Appendix I).

Consequently, all of the households carried out unsafe and unregulated disposal practices apart from the given service provided with private enterprise. However, these disposal practices carried out by households are various. This means that the extent to which it can affect the environment and people is definitely different. Accordingly, majority of the sample households' (130(65%)) burn their refuses or solid wastes in their compound. But, average numbers of the households were dumping it into various unpermitted places such as at road side, river side, in the gullies and near the bridges. Thus, 30(15%) of the respondents replied that they dump off solid wastes in the river side and gullies whereas 25(12.5%) and 15(7.5%) of the households responded that they have been dumping off it solid wastes in front of their compound at the road side and open space, and near the bridge around respectively (see table 4. 14).

From this finding, one can understand that there is low level of households' awareness towards the effective solid waste management in Jimma town. As a result, the current situation of household solid waste disposal practices in the town is worse. Furthermore, this illegal solid waste disposal means or practice is fundamentally brings different disasters and hazards over the environment and human life.

B. Law enforcement

National Hygiene and Environmental health regulation has a mandate to prepare solid waste management law or rules and regulations (proclamation). National Solid Waste Management Proclamation No. 513/2007 stated that "it is prohibited to dispose of litter on streets, waterways, parks, bus stops, train stations, sport fields, water bodies in urban areas or in other public places while litter bins are available". These rules and regulations are largely emphasized on solid waste handling responsibilities and obligations of individuals (households), establishments, and institutions. Beside the grant national solid waste management law, Jimma town has design its own solid waste management rules and regulations to protect environmental and human health. Accordingly, the sample householders were asked that whether they thought the existence of rules and regulations of SWM in Jimman town (see table 4.15 below).

Table 4.15: Rules and regulations of SWM at household level

Do you think that there are rules & regulations of SWM in Jimma town	**How do you rate the extent of the enforcement of rules and regulations**					**Total**
Yes	Strong	Very strong	Fair	Weak	very weak	122 (61%)
No	-	-	8(6.56%)	102(83.6%)	12(9.84%)	26(13%)
I don't know						52(26%)
Total	-	-	8(6.56%)	102(83.6%)	12(9.84%)	200(100%)

Source: Survey result 2014

Sustainable solid waste management can be achieved by one of the influencing factors particularly the enforcement of designed rules and regulation related to solid waste management in a given area.

As one can understand from the above table, significant numbers of the households have know the existence of solid waste related rules and regulations in Jimma town. In other words, 122(61%) of the respondents revealed that they know existence of rules and regulations of solid waste management in the town. This implies that significant numbers of the households are aware about the existence of rules and regulations of solid waste management practices in the study area.

But average number of the households (52(26%)) of the households did not know the existence of the law whereas, 26(13%) of them believed that no rules and regulations of solid waste management in Jimma town. This means 39% of the respondents are not known of the rules and regulations guiding solid waste management practices at household level.

In response to the interview, head of municipality also confirmed that municipality formulated its own rules and regulations guiding solid waste management in general and household solid waste management practices in particular. Even though municipality formulated legal binding, punishment specification is not separately identified to the law violators rather giving oral warning to the households who carry out illegal disposal practice or where the waste is illegally disposed off. As head stated most of the time solid wastes are illegally disposed at the middle of night when no one can see and control it. Therefore, it is difficult to identify the law violators. But the rules and regulations developed to manage solid waste disposal practices include the following;

- Illegal disposal is prohibited by individual households, commercial sectors and other institutions
- All of the waste generators must use public containers near to or around its villages or business areas.
- Households are required to clean their surrounding environment based on the program prepared with the kebele administrators or via building of cooperation among neighbours of the same villages.
- Households must have exposed those who practice illegal solid waste practice (who violate rules and regulations) in their villages, etc.

Even though guiding rules and regulations are existed, from this finding, one can understand that households are less informed and have lack of awareness about rules and regulations of solid waste disposal or management issues. The concerned body particularly municipality of Jimma town exerted little or no effort to promote the designed rules and regulations of solid waste management particularly at household level. Apart from this those households who believed the existence of rules and regulations also asked that how they do evaluate the enforcement of rules and regulations of solid waste management in the town. As depicted in the above table, there is also low enforcement of those existed rules and regulations. This means, 102(83.6%) of the respondents reflected that the enforcement of rules and regulations is weak while 12(9.84%) of households confirmed that it's very weak. But 8(6.56%) of the respondents replied that the enforcement of rules and regulations is fair. This finding implies that municipality of the town especially the concerned body gave low consideration to the law enforcement towards improper solid waste disposal practices carried out with the households and other sectors throughout the town. In response to the interview, head of the municipality indicated the way that the municipality follow up the application or enforcement of laws is mainly through kebele administrations based on the report submitted from the administrative units regarding the environmental sanitation and beauty performed in their kebeles' and to some extent by visiting or using personal observation in some areas of the town to check whether the household and other generators used the regulated storage sites or legally disposed its solid wastes or not.

Therefore, absence and poor enforcement of rules and regulations slow the effective household solid waste management. This related with what is found by Solomon (2006). He found that the absence of regulatory framework and low enforcement of rules and regulations hindered effective solid waste collection, storage and disposal system of the given town at large.

In relation with this, the sample households also asked that whether they ever seen the municipality making supervision and control over the illegal waste disposal practice in their village (see table 4.16 under Appendix I). Consequently, among the total sample householders (200), majority of the respondents (155(77.5%)) confirmed that they never seen while the municipality making supervision and control over the illegal act particularly unregulated solid waste disposal practice. Similarly, small number of the households (25(12.5%)) viewed that they are not sure whether the municipality carried out the supervision and punished the illegal solid waste disposal practioners.

In despite of this, a few number of sample households (20(10%)) reflected that they have seen the municipality making supervision and control over unregulated dumping sites. From this, one can understand that no consistent and a wide range of close supervision and control have been making by the local bodies especially municipality over the illegal household solid waste disposal practices in Jimma town.

Therefore, municipality has expected to do huge tasks beside of regulating solid waste disposal practices in order to create environmentally attractive living and working place throughout the town.

Moreover, the Chi-square test also clearly indicates that there is a significant positive relationship between law enforcement and effective solid waste management practices at 5% level (see Appendix II). This means that significant number of ineffective group (85.33%) of confirmed that law enforcement is weak whereas, 14.67% of the ineffective group viewed that law enforcement is very weak. But 80.85% and 17.02% of the effective group of the households confirmed that the application of law is weak and fair respectively. It implies that as the solid waste related laws regularly enforced, the effectiveness of household solid waste management practice becomes effective or the regular the enforcement of law, the more the effective household solid waste management would be accomplished.

C. Human power

The most important factors that have influenced level and quality of operation of solid waste management services related with manpower are size, qualification of staff, adequacy of waste management training and technical assistances.

In several cases, it is obvious that residents of a given area have a sense of responsibility for their home and immediate environment, but that public spaces such as streets and drains are considered the responsibility of the local bodies particularly municipality of a given town. Most often municipalities lack manpower to fulfil this task and sometimes they think the households are responsible for this. This has negative consequences for the cleanliness of public spaces and the behaviour of households.

Moreover, the responsible body for the solid waste management of Jimma town is a section organized under the municipality called "Green and Sanitation department", which has limited manpower and lacking relevant professionals that is a bottle neck for SWM.

In addition to this, the result of interview made with head of municipality confirmed that municipality is not equipped with required human power technically and professionally that can handle waste disposal activities currently undertaking in the town and its surrounding via developing strategic waste management planning. According to the work process manual of the municipality, 14 workers are involved in provision of solid waste management in the department.

From this one can understand that the department has very low manpower and this condition can be considered as a major problem for the existing HHSWM activity of the town. Based on the information obtained from interview made with the manager, the reason behind this inadequacy of manpower is lack of budget and low attention given by the department as well as higher officials to employ. On the other hand, related to qualification of workers most of them are assigned irrespective to their position. As a result, the existing staff of solid waste management are fail to make control and supervision particularly around the residential areas of the households where illegal disposal practice is a fundamental problem which gave bad image to the town.

According to the researcher personal observation, streets, open spaces and drainages are a full of solid wastes in Jimma town. This is due to the fact that there is lack of supervision and control beside the municipality of the town. In the previous section, households also confirmed that no regular supervision made beside the municipality or the concerned department over illegal disposal practices in the study area. Moreover, it is possible to conclude that urban problems are known to be personal and coping strategies rather than having the qualified staff that can design and develop the waste management strategies and plans in order to control the progress of solid waste management at hand. Therefore, from this we can understand that access of human resources can positively affect the effectiveness of solid waste management at household level in Jimma town.

D. Access of finance/budget

Finance is a very decisive factor for any public service delivery in any town or country. On the other hand, an environment which is safe and healthy for human beings is also a requirement for any towns' of countries. Therefore, any town should provide adequate finance to conserve and manage its environment in general and its solid waste in particular because of the fact that solid waste is one of the problems which damage the urban environment.

Despite of this, in Jimma town the provision of adequate funding for SWM in general and for household solid waste management in particular is a severe problem which causes the town environment to be deteriorated. It is characterized by poor budget for service delivery, insufficient funding for building infrastructures and absence of appropriate cost recovery mechanisms.

According to the interview made with the head of municipality, at present, the budget of Green and Sanitation department of Jimma town together with other service sectors of municipality is released from finance and economic development office under the jurisdiction of municipality as a region. In addition to this, municipality also collect its own revenue from various sources such as fees collects from different services and taxes such as land fees, house rent, fees from slaughter services, taxes from private houses, market, etc. In doing so, municipality prepare a budget to all the services given to the public, green and sanitation department also share the budget from these revenues. Because, the total budget that needs to provide SWM is covered only by the municipality as part of its yearly budget. But the department has no its own revenue rather depends on the budget released from municipality. This made the town supply of SWM service to be highly dependent on the capacity of the municipality of the town to generate adequate finance so as to handle the solid waste disposal throughout the town particularly at household level. As a result, the town become facing weak financial performance of solid waste management service since the municipality cannot collect adequate annual revenue to run all work processes. As per the result of the interview, the head also stated that in this year the total budget allocated for green and Sanitation department was about 175,230 birr.

From this situation, one can understand that the Jimma town municipal budget allocation to this sector or department has not been carried out based on the requirement of fund for service provision but simply it is based on the available fund since the budget is most often inadequate due to low revenue collection performance of the municipality. Head of municipality also share this idea and he stated that for releasing the actual budget to Green and Sanitation department, the municipality is eager to develop the actual plan with reference to wide range of revenue generation performance along with financial support from voluntary stakeholders as well as community participation over this grand job (solid waste management) having the slogan of "we do together we get the same".

Due to the above mentioned financial problem, municipality is unable to cover the problems of solid waste management particularly at household level with the provision of different facilities which include public containers near to the households, transportation trucks, push carts, gloves and other necessary facilities to the concerned bodies to ensure effective and sustainable solid waste management in Jimma town. One can understand from this finding that there is a direct or positive relationship between the budget or financial plan and effective household solid waste management in the stud area.

E. Equipments and facilities

In the process of household solid waste management there are various facilities and infrastructure that should be accomplished for providing efficient and effective service to citizens. However, these facilities are highly related with the economic performance and good institutional concern of a given town. For instance, it is possible to observe developed countries which give high concern or attention to solid waste management and used different sophisticated technologies for managing it.

In contrary to this, solid waste management in developing countries is mainly under taken with very inefficient equipments and technologies due to low level of economic development and low consideration given to this service. The situation is also the same as true in Ethiopia as a whole and in Jimma town in particular. As the response of interview made with head of municipality, recently, the Green and Sanitation department of the town runs this service with supplying only two dumping trucks and 52 storage containers. Besides this, the municipality has two regulated disposal sites located at Seka around Jimma airport and Marawa (at side of bada buna) which are 5 and 7 kms far away from the center of the town. Obviously, these amounts of equipments or facilities are not sufficient to convey the service when we compared with the rapid expansion of the town and the level of increasing waste generation rate of the society as also confirmed by head. In addition to shortage of other equipments, the problem of SWM in the town is also exacerbated by poor quality of truck and frequent break of it. This means that it has old car which serve for a long years.

Moreover, the limited containers are placed on specific places by far which is more deteriorated. According to the interview made with the head of municpality, one container provides a service to greater than 2000 people. Based on this, a few households are within the service area of the container. From the personal observation, some of the households are far away (more than 2km) from any nearby container. In addition, some Kebeles also do not have containers at all.

From this point of view, one container is giving service to around 15,000 residents in Jimma town. Similarly, focus group discussion also raised the problems related to the road infrastructure which is the serious issue of waste collection and transportation. These challenge upset the private waste collectors from discharging their given duty and responsibility in a proper manner. As mentioned above, most of the households living at a far distant from the centre where no road infrastructure is found and other facilities are not available. Due to this fact, it's difficult to the service providers particularly PEs to serve these individuals as far as possible.

As a result, most of the households who live this area are forced to dumping its solid wastes to illegal locations such as at road side, open spaces, near the river, in the drainage, etc. This exposed the environment of Jimma town to unhygienic and unhealthy environment which is difficult to live and working in. In response to the question asked the head of municipality regarding the measure or substantial effort made with municipality to solve the problems or to manage solid waste effectively at household level, the department provides extra facilities with available human power and contract out private participants with additional facilities such as carts at least to reduce the problems and achieve effective solid waste management as much as possible.

From this finding one can understand that the access of facilities and equipments have significant relationship with effective household solid waste management in the study area.

4.4. Private waste collectors/MSEs and its performance in Jimma town

Micro and small enterprise is one of the development actors that involves in various activities particularly waste management under the regulation of the government in one country or town. This is because of the fact that most of the public functions can be carried out by different stakeholders such as NGOs, CBOs, Voluntary Agencies and private sectors rather than the government alone. As stated earlier, solid waste management collection function is commonly the prominent task of the private sector in Ethiopia. Similarly, in a recent years micro and small scale entrepreneurs started to engage themselves in solid waste management especially on pre-collection in Jimma town.

According to the result of interview made with head of municipality, currently there are nineteen (19) MSSEs who are engaging themselves in solid waste collection service throughout the town. From these private enterprises, some of them are individually organized where as majority of them are organized with the support of municipality in to micro level. As compared to the previous years, currently all the administrative units of the town have private waste collectors unlike the gaps of access among the households because of different factors particularly road facility. But they are not equipped with necessary materials and equipments rather most of them are labor intensive with limited push carts and, cart and horses to collect solid wastes from some of the households who are near to the main road. This is due to the fact that they have no transportation truck, enough wheel carts and others to cover all the households living entire the administrative units. Totally MSSEs contains 179 workers or members. Among these, 79 of them are males whereas 100 participants are females. However, the researcher conducted focus group discussion with the three major private enterprises which have an access of transportation facilities such as trucks and push carts in providing collection service to wide ranges of households within the given kebeles. Unlike these three enterprises, others have no transportation trucks and adequate wheel carts (push carts) to provide a service at far distant. Moreover, it mainly involves young people including students in door-to-door collection of solid waste and transporting to the regulated disposal sites around the town.

These enterprises namely called Abba Milk solid waste collection and removal enterprise (AMSWCRE), Abba Fixa solid waste collection and removal enterprise (AFSWCRE) and Bosa Kito Beauty and Clean Association (BKBCA) which are found at Tana sefer, shewaber sefer, and Merkato respectively. Related to this the interview made with the head of municipality also confirmed that there are three major regulated private enterprises who are more equipped with necessary facilities and equipments such as trucks and wheel carts

(horses, push cart) as compared to the others. Moreover, discussions are made with these enterprises in a similar way with the same questions. Likewise, they forwarded and outshined almost the same ideas and problems regarding the current performance of their enterprises'.

According to the focus group discussion made with private waste collectors, these enterprises are at the infant stage which needs to be going further and equipped with enough facilities and equipments to provide wide coverage of solid waste collection services in the town. The enterprises have totally 60 members particularly AMSWCRE, AFSCRE and BKBCA have 20, 15 and 25 members respectively. These enterprises serve more than 6000 households, hotels and restaurants.

Regarding the current waste collection services, the private waste collectors also viewed that the households have two options to dispose its solid wastes. The first option is that households themselves take their solid wastes and drop it into a container nearest to their home. The second option is having contract agreement with micro and small enterprise associations (pre-collectors) to take their wastes to the disposal sites. For those who are interested to use the private enterprises, the service is given with affordable prices by taking the economic status of the households in to consideration. Each households charge for the service delivery about 10 to 20 birr depends on the volume of waste and hotels and commercial sectors paid up to 100 birr per a month. Apart from this, there are also many households who are living at periphery where there is no access of private waste collectors because of inadequate road infrastructure which limited the private enterprises to serve these people.

Moreover, the disposal sites that are currently in use for the total of Jimma town is open field located at a distance of about 5 and 7 kms from the town on Seka road in kofe kebele and Marawa around Bada Buna respectively. This is an agricultural area where no extra preparation done to make it proper disposal site. The worst thing in relation to waste disposal is that most of the time dumping is done starting from 500 meters out of the town along the road without even reaching the so called disposal site. These can be clearly seen by any traveller along the road to Seka.

4.4.1. Problems and challenges of Private waste collectors

Despite the interest they have showed in this area of capacity, they are entangled with a lot of constraints and problems that cannot be solved by their efforts alone. These people are not equipped with the required working tools, working places, financial capacity and skilled manpower.

Moreover, they complain that their customers do not recognize their activity as a proper job and do not pay them regularly. As a result they are found to be discouraged. But the PE should be encouraged to change Waste to Wealth by social sectors to create employment in the town through involving widely in composting and recycling and generate income. Therefore, possible incentive mechanism for PE has to be developed.

Regarding the feeling of the members of the sectors, some of them were reflected that sometimes they feel inferiority which may caused by their low salary, by the nature of their work and sometimes by their waste-picker background. The nature of their work is often considered unpleasant and filthy.

Moreover, the major challenges of private enterprises which limited them to optimally utilize their efforts include the following:

- Scarcity of equipments. All the enterprises have lack of adequate collection equipment and facilities. They have few carts with single trucks. As a result of this, sometimes they interrupt the services when the trucks need to be getting in garage.
- Lack of support from different stakeholders such as kebelles, municipality, NGOs, MSSE offices, etc apart from the some of the hotels such as Central Jimma Hotel, Ribka Hotel and Saife Hotel which provide clothes to the waste collectors. The MSSE office of the town refused to give credit to them for purchasing equipments and collection vehicle.
- Shortage of collection trucks and transfer stations together with weak controlling mechanism of the enterprises for time wastage.
- Lack of respect from the community as well as municipality and unwillingness of some households to pay for PEs monthly collection fee after the use the service and lack of respect or demoralization. In addition community refused PE to use transfer stations around their surroundings.
- Absence of training and protective materials given to them by municipality when necessary.

- Inadequate road infrastructure also restricts spatial coverage of PE to be limited only to the centre and road side.

In general from the above challenges of PEs and personal observation of the researcher, it is possible to conclude that PEs are not well organized and equipped with solid waste collection materials and technologies, they suffer from lack of financial credit, technical and moral support. As a result this the participation of Private waste collectors restricted to collect waste from roadsides residents, and centrally located kebeles. So, In order to solve the problem of SWM of the town, the municipality as well as the community should support them and should work a lot of activities to improve them.

CHAPTER FIVE

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Waste management in urban centres of Ethiopia such as Jimma, still remains one of the largest challenges that public administrators face because of the increasing quantities of different material streams and consumable products which become more and more complex and diverse as demographic and economic growth rise. It is extremely recognized that the existing solid waste management practice in Jimma town is ineffective both in terms of coverage and sanitary treatment of the waste. The solid waste collection service is very low, that means the major part of the solid waste generated in the city is uncontrolled and illegally disposed which creates unhealthy and unsafe environment to live and work in.

Households generate various types of waste compositions depends on their consumption patterns. As result indicates, majority of the households (30%) frequently generate plastics, old clothes, old shoes and leather wastes whereas, 27.55% of households generate used paper and wood scraps. This is due to the fact that most of the households usually use plastic bags for carrying commodities and ingredients particularly from the market that's why the volume of plastic waste is higher than others. In order to manage these wastes at source, significant number of the households (72.5%) use temporary storage facilities but average of them didn't use it rather they dump its solid wastes at open spaces and any other places near to them. As survey result shows, most of households use plastic bags (52.41%) followed by sack (31.03%) for storing its solid wastes. But small number of them (3.45%) uses metal bins for solid waste storage container by putting it either in the compound or in the house or kitchen. Hence, most households reuse the containers after disposal under the regular follow up putting on proper and secured places but some of them did not do that rather dump off with the containers either in to the public containers or illegal places.

The statistical tests resulted that most of the determinant factors are significantly related with the effective household solid waste management practice in the study area. From demographic factors, sex, educational level, family size and years of stay of the household heads have positively and negatively significant relationship with the effective household solid waste management at 5% level.

In contrary to this, age and average monthly income of the household heads has significant relationship with the effective HHSWM or they have no significant difference between two groups of households (effective and ineffective groups). For instance, the average mean difference between the age of effective groups and ineffective groups is 44.83 and 44.83 years respectively. It is the same as true for average monthly income which is exactly the same (1667.33 for both groups). From the gender point of view, even though majority of the respondents were male, female headed households are managing its SWs effectively than male headed households. That means 55.56% of the female headed are effective whereas, 55.18% of the male headed households are ineffective groups. Similarly, educational level and years of stay of the household heads positively influence effective HHSWM practices. This means, as education level and years of stay of the household head in a given place increases, the effective SWM also improve together in the study area. But it's not the case on family size, that means as family size increase improvement of HHSWM becomes decrease (there is negative relationship between both variables).

According to the result; among the socio-cultural factors, distance of the householders' house from the main road, awareness level and willingness of the household heads to pay for the service delivery have significant relationship with effective solid waste management at household level in Jimma town. For instance, effective group of the households (66.66%) are living near to the center or main road but 44.55% of the ineffective group are living at a distant of greater than 400m from the main road. Hence, it's negatively significant to effective HHSWM. Regarding to awareness level, significant number of the households (80%) confirmed that SWM is important but small number of them (20%) do not confirmed it.

Hence, all households who are effectively managing its solid wastes were confirmed the importance of SWM but 36.36% of the ineffective group claimed its importance. This indicates that awareness level and HHSWM have positive significant relationship at 5% level as proved by statistical test. In line with this, average of the household heads (39%) has no trend to separately store its SWs. But majority of them (61%) are experienced in SW separation particularly saleable and exchangeable materials because of different purposes such as collecting money or exchange to various equipments and commodities from 'Liwach' or 'Quraleos'. Yet, there is lack of awareness among the society which needs to be improved with necessary training and education program beside the concerned body especially

municipality. However, as survey result indicates, no training and education program given to the households in the study area.

According to the statistical test, willingness of the households to pay for the service delivery has positive significant relationship with effective HHSWM at 5% level.

From the institutional factors, access of PWCs, law enforcement, budget, equipments/facilities and human power are the major factors that highly affect the solid waste management at household level. Regarding access of PWCs, all the households who are effectively manage its SWs have access of door to door SW collection service provided with the PEs. But 54.55% of the ineffective group of the households have no access of PWCs. As result indicates, access of PWCs is highly significant to effective HHSWM at 5% level in the study area. Moreover, majority (66.5%) the households who have no PWCs are limited by the distance of their house from the main road or centre because of the absence of adequate road infrastructure in the town so that they are enforced to dumping off its solid wastes in to drainage, at road side, rive bank, open space, etc. Apart from this, majority of the households (65%) burn its solid wastes in their compound and the remained percentage of them dumping off the waste everywhere else or at illegal places.

With regard to law enforcement, as per the National Hygiene and Environmental Health Regulation, Jimma town has also a mandate to formulate the rules and regulations of SWM at the municipal level and publicize it to the general public. However, average numbers of the households (39%) do not know the existence of rules and regulations of SWM particularly at household level in Jimma town. In addition, majority of the ineffective group of the households confirmed that the enforcement of law is weak in the town. But a number of effective group believed that enforcement of law is fair. As shown on the result of Chi-square test, law enforcement is positively affect effective solid waste management at 5% significance level.

Moreover, human power, budget and access of equipments and facilities are the other leading factors that determine the effectiveness of HHSWM in Jimma town. For instance, Municipality particularly Green and Sanitation department is currently running the SWM activities having limited number human power with lack of relevant professionals and technical skills. Similarly, the department is characterized by inadequate funding capacity for SWM that leads the town for sever problems which causes the town environment to be deteriorated.

As result indicates, the budget for municipality released from Finance and Economic Development Office of the Oromia region in addition to its own revenue generation.

However, this budget is inadequate for service delivery and build road infrastructure in the town. Due to this financial problem, municipality is failed to manage HHSW disposal practices effectively. In addition, there is also a great problem or insufficient of facilities and equipments to convey the service when we compare with the rapid expansion of the town and level of increasing waste generation rate of the society. These problems include lack and poor quality of truck, lack of containers, inadequate road infrastructure, sanitary land fill, etc.

MSSE or private enterprise is one of the development actors engaged in different activities particularly solid waste management in the Jimma town. However, enough attention and enabling condition is not given and made for PWCs. They are also not equipped with the necessary facilities, equipments and protective materials. This has aggravated the solid waste management problems and challenges thus leading to public health, aesthetic and ecological concerns. Moreover, no environmental initiative is available for the society and private sector involvement in re-use, recycle and composting of the wastes. From this we can conclude that solid waste management is not considered as essential development segment to meet the goals set in the national and regional policies and strategies for sustainable development.

5.2. Recommendation

Based on the analysis and conclusion discussed above, the following recommendations are forwarded to improve the effectiveness of household solid waste management practice in the study area.

As indicated in the finding, the current situation of solid waste management in Jimma town is worse because of various illegal and unregulated disposal solid waste practices of the households in their villages. Households have lack of awareness to manage its solid wastes at source using temporary storage facilities rather they throw out the solid wastes everywhere else like in the gutter, at road side, open spaces, etc. Therefore, it's advisable to the households to handle its solid wastes at source using temporary storage facilities and even building cooperation among the neighbourhoods so as to make regular and consistent follow up to control and expose illegal disposal practitioners to the concerned bodies in their village.

Similarly, it's better for the government bodies particularly the concerned department (Green and Sanitation department) to develop community-based solid waste management (build 1 to 5 groups among neighbours as a control mechanism of illegal SW disposal practices) and create massive awareness campaign regarding the adverse impact of the ineffective solid waste management to the environment and human life using open meeting, media and workshops.

According to the survey result, significant number of effective group is female headed households as compared to the male. Therefore, the government particularly municipality is expected to eliminate this gap within the broad range of awareness creation through training and education program between both sex that any individual households are equally responsible to manage its solid wastes and even protect its surrounding (environment).

In addition, it's recommended that municipality or the concerned department has to encourage and initiate the households to use door to door solid waste collection services provided by PEs by fulfilling all the requirements such as building road infrastructure particularly for those who are living at the periphery and have no access of PWCs due to absence of road facility. Related to this, the municipality should provide public containers to all the villages' of the town based on their size particularly near to the households. This is due to the fact that on average one container serves about 15,000 people (as shown in the result). This indicates that there is lack of public containers throughout the town.

As mentioned above, municipality has to be creating awareness campaign among the society on how to manage solid wastes especially at household level by means of modern technologies and others particularly through media (Jimma FM and Jimma University community based-radios), solid waste management campaign, open meeting with households, workshop, and preparing fixed training and education program at least ones a year to all the households at the same time.

In relation to the above recommendation, Education awareness campaigns on solid waste management should be carried out by the municipal council via local radios, local newspapers posters, workshops, work places, nongovernmental organizations (NGOs), etc. The campaigns should address issues, such as waste reduction methods, separation at generation points as well as encouraging recycling and composting. Incentives for recycling initiatives could be made because this would serve as a motivation and get the community more committed to the course. Sufficient and sanitary landfill operations should be carried out in accordance with state regulations. In addition, successful examples of household solid waste management practice in other developing countries and even in Ethiopia (to some extent) particularly Bahir Dar, Adama, Hawassa, etc could be emulated as well.

According to the result, average numbers of households do not know the existence of rules and regulations of solid waste management in the town. The laws or rules and regulations governing solid waste management should be strengthened and fully expressed to the community by municipality of the town particularly the concerned department. Similarly, weak enforcement of rules and regulations is a critical problem in the study area. To solve this, municipality has to give enormous attention to the enforcement of solid waste management related laws by assigning commit and honest persons who are qualified on the area of concern and can follow up the progress of household solid waste disposal practices regularly by visiting the residential areas and take various measures over those who violate the SWM related rules and regulations starting from oral warning to punishment.

The finding of the study disclosed that there is shortage of budget to run the household solid waste management services effectively. Therefore, it's better if municipality together with various stake holders such as NGOs and other donor agencies to allocate enough budgets facilitate transportation facilities like truck, wheel carts, and incentives for all administrative units to ensure the effective solid waste management particularly at household level.

Furthermore, lack of strong inbuilt or ineffective household solid waste management was found to be one of the challenges of finance. Hence, municipality is expected to assign the adequate annual budget to the solid waste management department (Green and Sanitation department) so that they can monitor and maintain the quality of household solid waste management in the town. For the human resource related problem, the municipality has to capacitate "the Green and Sanitation department" with relevant manpower and equipment both qualitatively and quantitatively.

As finding of the study indicated some of the households travel more than 2km to find a container. Therefore, the municipality should increase waste storage sites or the number of containers and distribute distances reasonable from households or firms, boarder Kebeles should be given proper attention.

As indicated in the result, PEs/PWCs in Jimma town are on the infant stage and they are not equipped with necessary equipments and other facilities made them fail to do so. Moreover, recognition of and support for small-scale and informal sector waste-related enterprises is a significant element of sound practice, especially in developing countries, and to a lesser extent in transition and industrialised countries as well. These businesses usually remove materials from the waste stream, at low cost, saving the government money. Disruption of their operations can increase the burden on public works and sanitation budgets significantly.

Therefore, municipality has to create enabling conditions to and provide the necessary materials and facilities for MSSE (PWCs) which help them to do so. In addition, the people in general are expected to encourage and respect the private waste collectors and their work, so that all the householders become willing or interested to pay for their services.

On the top of this, adequate planning of solid waste management is essential if communities and municipality are to successfully address the challenge of a sustainable development including resource conservation, climate protection, and pollution prevention. Thus, the need to upgrade current solid waste management practice at household level is very vital due to the effects on human health and the environment.

In general, if the town administration improves its effort on household waste management in general and household solid waste management system in particular and gives equal attention to all corners of the town, it will not be very far to see the vision of the town administration "Beautiful, Clean and Green Jimma".

References

Abebe, Z. and Kebede, F. (1999) Assessing Awareness and Practice of Solid Waste: Integrated Development for Water Supply and Sanitation, 25th WDC Conference. Addis Ababa, Ethiopia

Abel, A. (2007) Analysis of Solid Waste Generation in Traditional African City: Nigeria International Institute for Environment and Development. Ogbomoso, Nigeria

Altaf, M.A. and J.R., Deshazo (1996) House hold demand for improved solid waste management: A case study of Gujranwala, Pakistan. World development, 24: pp. 857-868

Ashenafi, H. (2011) Determinants of Effective Household Solid Waste Management Practice: The Case of Ambo Town. A Master's Thesis Submitted to School Graduate Studies of Mekelle University. Mekelle, Ethiopia

Best, J. and Khan, J. (1989) Quantitative **Research in Education**; Englewood Cliffs (NJ), Prentice Hall, England. Aavilable at: http://www2.warwick.ac.uk/teachingresearchprocess/. (Accessed date: 20 February 2014)

Burns, N. and Grove, S. (2003) Research Design and Methodology: An introduction. USA. Available at: http://www.rdm/us/htm/. (Accessed date: 20 February 2014)

CED (2003) Study of the Attitude and Perception of Community towards Solid Waste Management: A Case Study of Thiruvananthapuram City – Phase II. A project Submitted to Kerala Research Program on Local Level Development, Centre for Development Studies, Thiruvananthapuram.

Chalmin, P. and Gailtochet, C. (2009) From Waste to Resource: An Abstract of World Wide Survey. Cyclopes, Veolia Environmental Services, France

Claude, P. (2012) Waste: The Challenge Facing Developing Countries; Private Sector and Development Issues. Available at: http://www.proparco.fr/Ethiopian. (Accessed date: 28 March 2014)

Cointreau, L., Saundra, G. and Bartone, C. (2002) Private Sector Participation in Municipal Solid Waste Services in Developing Countries. Available at: http://www.wastedisposal/. (Accessed date: 02 May 2014)

CSA (1994) Population and Housing Census of Ethiopia. Addis Ababa, Ethiopia

CSA (2007) Population and Housing Census of Ethiopia. Addis Ababa, Ethiopia

Dadso, A. Shaibu, I. and Godfred, S. (2013) urban households' willingness to pay for improved solid waste disposal services in Kumasi Metropolis, Ghana: Urban research studies, Kumasi, Ghana. Available at: http://www.uswm/dp/g.htm. (Accessed date: 29 May 2014)

Degnet, A. (2003) Determinants of Solid Waste Disposal Practices in Urban Areas of Ethiopia: House hold Level Analysis, Project Muse Scholarly Journals. Ethiopian Economic Association/ Ethiopian Economic Policy Research Institute, Vol. XXIV (1). Addis Ababa, Ethiopia. Available at: http://www.muse.uq.edu.au/journals. (Accessed date: 20 March 2014)

Dereje, T. (2001) Financial Urban Infrastructure and Services in Ethiopia: The case of Solid Waste Management in Adama town. Adama, Ethiopia

Dickson, E. (2012) Municipal Solid Waste Management in Grahams town- Republic of South Africa: A Degree Thesis for A Bachelor of Natural Resources. Grahams, South Africa. Available at: http://www.sa/mswm.org/. (Accessed date: 10 May 2014)

Dr. Uwadiegwu, B.O. and Dr. Chukwu, K.E. (2013) Strategies for Effective Urban Solid Waste Management in Nigeria: European Scientific Journal. Nnamdi Azikiwe University. Akwa, Nigeria

Federal Democratic Republic of Ethiopia (1997) Environmental Policy of Ethiopia, Federal Negarit Gazita. Addis Ababa, Ethiopia. Available at: http://www.epe.gov.et. Accessed date: 20 March 2014)

Federal Democratic Republic of Ethiopia (2007) solid waste management proclamation. Proclamation No. 513/2007, Federal Negarit Gazita, 13th year No. 13, Addis Ababa 12th February 2007. Available at: http://www.eepco.gov.et (accessed date: 02 january 2014)

Gebrie, K. (2009) Management of Domestic Solid Waste in Ethiopia: Operational Analysis and Assessment of Constraints in Bahir Dar Town, the Capital of Amhara National Regional State, Ethiopia. Available at: http://www.amazon.com. (Accessed date: 5 February 2011)

Gerold, A. (2009) Integrating the Informal Sector in Solid Waste Management Systems: Basic Aspects and Experience, GIZ. Available at: http://www.iis/swms/org. (Accessed date: 28 March2014)

Gidarakos, E. Havas, G. and Ntzamilis, P. (2008) Municipal Solid Waste Composition Determination Supporting the Integrated Solid Waste Management system in the Island of crete. Athens, Greece

Hanrahan, D. Srivastava, S. and Sita, A. (2006) Improving Management of Municipal Solid Waste in India: Overview and Challenge. Environment and Social Development Unit; World Bank, South Asia Region

Holloway, I. and Wheeler, S. (2002) Qualitative Research in Nursing; 2nd edition: Oxford, Black well. Available at: http://www.nursingtimes.net/qualitative-research/arti. (Accessed date: 15 March 2014).

Hoornweg, D. and Bhada-Tata, P. (2012) What a Waste: A Global Review of Solid Waste Management. Urban Development and Local Government Units. World Bank, Washington D.C. Available at: http://www.iswa.org/nc/en/no/news. (Accessed date: 05 May 2014)

Kofoworda, O.F. (2007) Recovery and Recycling practices in Municipal Solid Waste Management in Lagos: Waste Management, V.27 (9). Lagos, Nigeria

Lall, S.V., Deichmann, U., Lundberg, M.K.A. and Chaudhury, N. (2004) Tenure, Diversity and Commitment: Community Participation for Urban Service Provision. Journal of Development Studies

Martin, M. (2000) Globalization, Development and Municipal Solid Waste Management in Third Wold Countries, Mexico

Melaku, T. (2008) Household Solid Waste Generation Rate and Physical Composition Analysis, In Jimma Town Ethiopia. A Master's Thesis presented to the school of graduate studies of Addis Ababa University. Addis Ababa, Ethiopia.

Ministry of Urban Development and Construction (2012) Solid Waste Management Manual: With Respect to urban Plans, Sanitary Landfill and Solid Waste Management Planning. Addis Ababa, Ethiopia

Moore, T. and McCabe, J. (2006) Introduction to the Practice of Statistics. Third edition, pp. 219.

MRGG (2005) Solid Waste Management Strategy: Guiding Principles and Strategic Options, Intermediate Technology Development Group. Municipal Council UN-Habitat Basic Urban Services Initiative; International Water and Sanitation Centre (IRC), Sri Jayawardenapura, kotte. Available at: http://www.swm/iwsc/org. Accessed date: 28 March 20014)

Nag, A. (2005) Environmental Education and Solid Waste Management: Available at: htt://www.books.google.com.et. (Accessed date: 25 March 2014)

Nashim, I.J. (2004) Attitudes and Behaviour of Low Income Households towards the management of domestic solid waste in Tafelsing, Mitchell J Plain. Available at: htt://etd. UNC.ac,za/ustrtiles/modules/etd/docs/etd-unit.Pdf. (Accessed date: 25 March 2014)

Nigatu, R. Rajer, D. Sundara and Buzunesh, B. (2011) Challenges and Opportunities in MSWM: The case of Addis Ababa city, Central Ethiopia. Institute of Environment, Gender and development; Hawassa University, Ethiopia.

Ogawa, H. (2002) Sustainable SWM in developing countries: Western Pacific Regional Environmental Health Center (EHC), Kaula Lumpur, Malaysia. Available at: http://www.gdrc.org/uem/waste/SWM/foga-wal.htm.(Accessed date: 28March 2014)

Parahoo, K. (1997) Nursing Research: Principles, Process and Issues. University of Ulster; Palgrave, North Ireland. Availablle at: http://www.science.ulster.ac.uk/inhr/profiles/k. (Accessed date: 15 February 2014)

PPIAF (2011) PPIAF Supports Private Sector Participation in the Solid Waste Sector in Ethiopia. Available at: http://www.ppiaf/et/ps/swm. (Accessed date: 20 February 2014)

Prime Consultants (2008) Solid Waste Management: Factors affecting standards, Methodologies and Planning with a specific reference to towns of Amhara National Regional state, Ethiopia

Rajinikanth, R. and Ramachandra, T. (2000) Improved Solid Waste Management System in the Catchment Area: Symposium on Restorations of Lakes and Wetlands. Available at: http://www.wgbis.ces.iisc.ernet.in/energy/water/htm. (Accessed date: 05 March 2014)

RIO declaration (1992) Earth summit agenda 21: The United Nations programme of action from RIO. New York. United Nation department of public information, pp. 206

RIPPLE (2006) Urban Waste Management: Research Inspired Policy and Practice Learning in Ethiopia. Addis Ababa, Ethiopia

Samuel, S. (2006) Commercial Solid Waste Generation and Composition Analysis: Arada Sub-city. Addis Ababa, Ethiopia

Samuela, A. (2011) Fiji's National Solid Waste Management Strategy 2011-2014. Republic of Fiji, Pacific Region. Available at: http://www.rf/swms/htm. (Accessed date: 10 April 2014)

Schertenleib, R. and Meyer, W. (1992) Municipal Solid Waste Management in Developing Countries: Problems and Issues. Gohaneseberg, South Africa

Schübeler, p. (1996) Urban Management and Infrastructure: conceptual framework for municipal solid waste management in low-income countries. UNDP/UNCHS/World Bank/SDC Collaborative Program on Municipal Solid Waste management in Low-Income Countries. Working paper No. 9. Available at: http://www.worldbank.org. (Accessed date: 20 March 2014)

Screenivansan, J. Govindan, M. and Chinnasamy, M. (2012) Behavioural determinants of domestic solid waste minimization- a Malaysia perspective. 2nd International conference on social science and humanity, IPEDR Vol. 31 (2012), LACSIT press. Singapore

Smith S.E. (2010) what is Solid Waste Management. Available at: http://www.wise greek.com/what-is-solid-waste-managment.htm. (Accessed date: 10 December 2013/14)

Solomon, A. (2006) Solid Waste Management: A Case Study of Household Solid Waste Management in Arada Sub-City, Addis Ababa. A Master's Thesis Presented to the School of Graduate Studies of Addis Ababa University. Addis Ababa, Ethiopia.

Solomon, C. (2011) Assessment of Municipal Solid Waste Management Service: A case study of Dessie town. A Master's Thesis Submitted to school of Graduate Studies of Addis Ababa University. Addis Ababa, Ethiopia

Techobarglous, G. (2002) Hand book Solid Waste Management. 2nd edition .McGraw hill International edition, USA.

UNDP (2004) Urban Agriculture: Food, Jobs and Sustainable Cities. UNDP Urban Harvest Working Paper Series, Paper No. 1, New York.

UNEP (1996) International Source Book on Environmentally Sound Technologies for Municipal Solid Waste Management: UNEP Technical Publication 6, Nov. 1996. Available at: http://www.unep.or.jp/ietc/estdir/pub/msw/. (Accessed date: 15 December 2013/14)

UNEP (1999) Global Environmental Outlook: United Nations Environmental Program. Available at: http://www.unep.org/geo2000/. (Accessed date: 15 December 2013/2014)

UNEP (2009) Developing Integrated Solid Waste Management Plan: Training Manual for Assessment of Current Waste Management System and Gaps there in, Volume 2. OSake/shiga, Japan. Available at: http://www.unep.or.JP/ietc/publications/spc/ISWM Plan-Vol 2.pdf. (Accessed date: 20 March 2014)

Unite Nations Centre for Human Settlement (nd) Refuse Collection Vehicles for Developing Countries. Available at: http://www.unchs/org/in/swm/. (Accessed date: 05 March 2014)

United Kingdom Environment Protection Act (1990) Definition of waste. Available at: Wikipedia, the free encyclopaedia. http://www.en.wikipedia.org/waste. (Accessed date: 12 March 2014)

World Bank (2004) Regulatory and Institutional Reform in Municipal Solid Waste Management Sector: Baseline Review of the Current Management of Solid Waste Situation in Ethiopia. Addis Ababa, Ethiopia

Yami, B. (1999) Solid Waste Management in Ethiopia: Integrated development for Water Supply and Sanitation, 25th WEDC Conference. Addis Ababa, Ethiopia.

Zebenay, K. (2010) The Challenges of Solid Waste Management in Urban Areas: The Case of Debre Markos town. A Master's Thesis Submitted to School of Graduate Studies of Addis Ababa University. Addis Ababa, Ethiopia

Zelalem, F. (2006) controlling the Informal Sector: Solid Waste Collection and Addis Ababa city Administration, 2003- 2005. M.Phil Thesis Submitted to the department of Geography Faculty of Social Science and Technological Management, Rorwegian University of Science and Technology. Trorndheim, Norway.

Zerayakob, B. (2002) Analysis and Development of Solid Waste Management system of Addis Ababa: A Master's Thesis Presented to The School of Graduate Studies of Addis Ababa University. Addis Ababa, Ethiopia

Zurbrügg, C. (2003) Urban Solid Waste Management in Low-Income Countries of Asia: How to Cope with the Garbage Crisis. Presented for Scientific Committee on Problems of the Environment (SCOPE) Urban Solid Waste Management Review Session. Durban, South Africa, November 2003.

Zurbrugg, C. and Schertenleib, R. (1998) Main Problems and Issues of Municipal Solid Waste Management in Developing Countries: With Emphasis on Problems Related to Disposal by Landfill. Presented at the Third Swedish Landfill Research Symposia, October 1998 Lulea, Sweden

Appendix

APPENDIX I

Table 4.2: Temporary SW storage containers at household level

Item 1	Availability of temporary SW storage container (s)	Frequency	Percent (%)	Cum. percent
	Yes	145	72.5	72.5
	No	55	27.5	100
	Total	200	1000	
Item 2	Reuse the storage container (s)	Frequency	Percent (%)	Cum. percent
	Yes	110	75.9	75.9
	No	35	24.1	100
	Total	145	100	

Table 4.4: Importance of solid waste management

	Importance of solid waste management	Frequency	Percent (%)	Cum. percent
Item 1	Key to control environmental pollution	80	50	50
	Avoids environmental degradation	40	25	75
	Avoid social and economic problems	12	7.5	8
	It has an economic value like recycling	8	5	82.5
	Improve poor quality of land (sanitary landfills)	20	12.5	87.5
	Others	-	-	100
	Total	160	100	
Item 2	Thinking of SWM as burning issue	Frequency	Percent (%)	Cum. percent
	Yes	80	40	40
	No	92	46	86
	I don't know	28	14	100
	Total	200	100	

Table 4.9: Existence of private waste collectors in Jimma town

Existence of PE/PWCs in Jimma town	Frequency	Percent (%)	Cum. percent
Yes	165	82.5	82.5
No	35	17.5	100
Total	200	100	

Table 4.11: Factors that limited HHs to have access of PWCs

Factor (s) limit to use service given by PWCs	Frequency	Percent (%)	Cum. percent
Distance from the main road	40	66.7	66.7
Unable to pay for	8	13.3	80
No such services at all	12	20	100
Others	-	-	
Total	60	100	

Table 4.12: The reason for unsatisfied of households with PWCs

The reason (s) for unsatisfactory & very poor of the given service	Frequency	Percent (%)	Cum. percent
Poor commitment from PE	10	12.5	12.5
Lack of infrastructure such as road	15	18.75	31.25
Lack of adequate facilities such as trucks, wheel carts, and others from PE	50	62.5	93.75
Shortage of human power from PE	3	3.75	97.5
Problem of collection interval from PE	2	2.5	100
Others	-	-	
Total	80	100	

Table 4.14: Other means used to dispose SWs at household level

Other means always used to dispose SW	**Frequency**	**Percent (%)**	**Cum. percent**
Dumping in front of their compound at RS & OS	25	12.5	12.5
Burry inside the compound	-	-	
Dumping in the river side and gullies	30	15	27.5
Dumping near the bridges around	15	7.5	35
Burn in the compound	130	65	100
Simply dispose in the compound	-	-	
Others	-	-	
Total	200	100	

Table 4.16: Supervision and control made by municipality over illegal SW disposal

Supervision and control or punishment by municipality over illegal dumping	**Frequency**	**Percent (%)**	**Cum. percent**
Yes	20	10	10
No	155	77.5	87.5
I'm not sure	25	12.5	100
Total	200	100	

APPENDIX II

Summary of Descriptive statistics -Chi-square (X^2) test result

Variables		Effective SWM		Ineffective SWM		X^2- test	Sig.
		Frequency	Percent	Frequency	Percent		.036
Sex of HH	Male	40	44.44	64	58.18	3.743*	
	Female	50	55.56	46	41.82		
Edu of HH	Primary education	10	11.1	20	18.18	21.745*	.035
	Secondary education	15	16.67	20	18.18		
	Certificate	17	18.89	34	30.91		
	Diploma	20	22.22	19	17.27		
	First degree	23	25.56	10	9.1		
	Second degree & above	5	5.56	1	0.9		
	No formal education	0	0	6	5.46		
DMR	<100m	23	25.55	19	17.27	33.391*	.000
	100- 400m	60	66.67	42	38.18		
	>400m	7	7.78	49	44.55		
AccePWCs	Yes	90	100	50	45.45	70.130*	.000
	No	0	0	60	54.55		
Willpay	yes	90	100	98	89.09	10.445*	.001
	No	0	0	12	10.91		
Awarlevel	yes	90	100	70	63.64	40.909*	.000
	No	0	0	40	36.36		
Lawenfmt	Strong	0	0	0	0	17.454*	.000
	Very strong	0	0	0	0		
	Fair	8	17.02	0	0		
	Weak	38	80.85	64	85.33		
	Very weak	1	2.13	11	14.67		

NB: Significant at 5% level

APPENDIX III

Summary of Descriptive Statistics- Two sample T-test result

Variables	Samples		Effective SWM		Ineffective SWM		T- test	Sig.
	Mean	Std. dev	Mean	Std. dev	Mean	Std. dev		
Age of HH	1.82	.562	1.82	.510	1.83	.604	.063	.950
Fsize	2.53	1.421	2.21	1.362	2.79	1.421	2.925*	.004
AMI	3.97	.977	3.99	.918	3.95	1.026	-.247	.805
YS	2.76	.947	3.00	.899	2.56	.944	-3.323*	.001

NB: significant at 5% level

APPENDIX IV

QUESTIONNAIRES PREPARED FOR HOUSEHOLDS

This questionnaire is prepared only for academic purpose for the fulfilment of Masters Degree in Public Management. The objective of the study is to examine and identify the determinants of effective household solid waste management practice in Jimma town. Moreover, your response is very crucial for the successful accomplishment of this study. Therefore, you are kindly requested to read all the questions and fill with genuine responses. Please, feel free to indicate your opinion because no response is treated as wrong and remain confidential. Thank you for your cooperation.

Instruction:

- No need of writing your name
- Read the question before provide your answer
- Please, provide appropriate response by encircling one of the given alternatives or specify your opinion
- No need to consult others to fill the questionnaires
- Please, complete all questions honestly

Code _____

Name of enumerator _____

Name of super visor _____

Kebele _____

Part one: Demographic profiles of the respondents

1. Sex: A. Male B. Female

2. Age: A. 15- 29 years old B. 30- 64 years old C. 65 and above years old

3. Educational level: A. Primary education B. Secondary education C. Certificate
D. Diploma E. First degree F. Second degree and above
G. No formal education

4. Family size: A. ≤3 B. 4 C. 5 D. 6 E. 7 F. ≥8

5. Average monthly income (in birr): A. Less than 500 B. 500 – 1000 C. 1001 – 1500
D. 1501 -2000 E. Greater than 2000

6. Years of stay in Jimma town _____

7. The distance of your house from the main road (in meters) _____

Part two: The current conditions about household solid waste disposal practices in Jimma town

1. How often do you clean your room or house?

A. Every day
B. Sometimes
C. Within two days terms
D. Within three days terms
E. Within a week terms
F. Specify others _____

2. Which solid waste composition you generate frequently in your house? (you can choose more than one).

A. Ash and dust
B. Food waste/left over
C. Paper and wood scarp
D. Plastic, old clothes, old shoes and leathers
E. Glass, cans, ceramics and metals
F. Specify others _____

3. Do you have temporary solid waste storage container in your house?

A. Yes B. No

4. If your answer for question No. 3 is 'Yes', what type of solid waste storage container do you use in your house?

A. Plastic bags
B. Sack
C. Basket
D. Private pit (hole in the ground)
E. Metal bins
F. I don't use
G. Specify others _____

5. Do you need the containers back again to reuse or under regular follow up and place in your compound or surrounding? A. Yes B. No

6. Do you have an access to door to door solid waste collection service from the municipality of Jimma town? A. Yes B. No , If your answer is 'No' go to question No. 8

7. If your answer for question No. 6 is 'Yes', how many times you get this service in a moth?

A. 2 times/week B. 1 time/week C. 2 times/month D. 1 time/month

E. As available

8. If your answer for question No. 6 is 'No', what are the factor (s) that limit you to have an access of the services?

A. No such services at all
B. Distance of my house/village from the main road
C. Specify others _____

9. Do you use private sector/private waste collectors for door to door solid waste collection services?

A. Yes B. No , If your answer is 'No', go to question No. 15

10. If your answer for question No. 9 is 'yes', how many time you get this service in a month?

A. 2 times/week B. 1 time/week C. 2 times /month D. 1 time/month

E. As available F. Specify others _____

11. If your answer for question No. 9 is 'Yes', how much do you pay for the service deliver per a month? _____

12. If your answer for question No. 9 is 'Yes', how long you have been served ?

A. For 1 year B. For 2 years C. For 3 years D. For 4 years E. For 5 years and above

13. If your answer for question No. 6 or and 9 is 'Yes', How do you rate the extent of solid waste management services given by municipality of the town or and Private waste collectors of Jimma town?

A. Satisfactory B. Very satisfactory C. Fair D. Unsatisfactory E. very poor

14. If your answer for question No. 13 is 'Unsatisfactory or Very poor', what is/are the reason (s) do you think? (You can choose more than one alternatives).

A. Poor commitment from Private enterprise/Private waste collectors or and municipality

B. Lack of infrastructure such as road

C. Lack of facilities such as truck, cart and others from private enterprise or and municipality

D. Shortage of human power from Private enterprise or and municipality

E. Problem of collection frequency or time interval for collection from municipality or and Private enterprise

F. Specify others _____

15. If your answer for question No. 9 is 'No', do you think that the following factor (s) makes you unable to use the service?.

A. Distance of my house/village from the main road C. No such services at all

B. I am unable to pay for D. Specify others _____

16. How do you keep the solid waste generated in your house until the solid waste collectors or service provider come up with their vehicle within the given time or if they might not come at the given time or day?

A. Keep in my home with the available temporary storage containers until they come back

B. Throw out to the open space in my village

C. Burn at the road side E. Collect in the kitchen

D. Collect in my compound on the bare floor F. Dump in the gutter

G. Specify others _____

17. Apart from the above bodies or services given by municipality or and private waste collectors (see question No. 6 and 9), what are the other means you always use to dispose solid waste generated from your house?

A. Dumping in front of my compound at road side and open space

B. Burry inside my compound E. Burn in my compound

C. Dumping in river side and gullies F. Simply dispose in my compound

D. Dumping around the bridges G. Specify _____

18. Have you ever seen the municipality making supervision and control over or punish illegal dumping of solid wastes on the streets, open areas, river side's and other areas?

A. Yes B. No C. I'm not sure

19. Do you know any non-profit organizations such as NGOs or and CBO which are working on or providing sponsorship for Solid waste management in your town?

A. Yes B. No

20. If your answer for question No. 20 is 'Yes', specify the name of NGOs or and CBO working on or sponsoring solid waste management in your town

_____

21. Do you ever engaged on environmental cleaning program prepared by municipality in your village or kebele?

A. Yes B. No ,if your answer is 'No', go to question No. 23

22. If your answer for question No. 21 is 'Yes', how often do you participated per year particularly last year? A. 1 time B. 2 times C. 3 times D. 4 times

E. specify others _____

23. If your answer for question No. 21 is 'No', why? State your reason

A. No such a program at all B. I'm busy C. It is unplanned/unprogrammed

D. Specify others _____

Part three: Households' awareness and attitudes about solid waste disposal

1. Do you think that solid waste management is important?

A. Yes B. No C. I don't know

2. If your answer for question No. 1 is 'Yes', what is/are the importance of solid waste management? (You can choose more than one alternatives).

A. Key to control environmental pollution B. Avoids environmental degradation

C. Avoid social and economic problems D. It has an economic value like recycling

E. Improve poor quality of land i.e sanitary landfills

F. Specify others _____

3. Does solid waste management is burning issue as compared with other service like road service, water supply, electric power supply, etc

A. Yes B. No C. I don't know

4. Have you ever got training, education or any other information about solid waste management, environmental and other problems happened (like health related problem) because of unsafe solid waste disposal? A. Yes B. No

5. If your answer for question No. 4 is 'Yes', what changes did you bring in your compound or village? _____

6. Would you be interested to have learning program about solid waste management, environmental impact of waste and different ways of reducing, treating and managing the waste stream? A. Yes B. No

7. If your answer for question No. 6 is 'Yes', which method is your favourite or good for you to increase your knowledge? (you can choose more than one)

A. Door to door education

B. Brochures distributed to residents

C. Open seminars

D. Teaching program through newsletter and magazines

E. Educational programs in radio and television

F. Solid waste management campaign

G. Through exhibitions of presenting good practices in solid waste management

H. Specify others _____

8. Do you think that there are rules and regulations of solid waste management in Jimma town? A. Yes B. No C. I don't know

9. If your answer for question No. 8 is 'Yes', how do you rate the extent of the enforcement or application of the rules and regulations?

A. strong B. Very strong C. Fair D. weak F. very weak

10. Which way do you think is important to improve solid waste management? (You can choose more than one alternatives)

A. Payment of fees for collection B. Provision of designated dumping sites

C. Provision of massive education/awareness campaigns

D. Building cooperation among residents or neighbours towards solid waste collection

E. Fines punishment for discriminate or unsafe disposal

F. Specify others _____

11. Which of the following organ (s) or institute (s) is/are responsible to household solid waste management?

A. Household C. Municipality D. All of them

B. Private enterprises/private waste collectors E. Specify others _____

12. Do you have a trend to separately store solid wastes generated in your house which can be recover or recycle from un recycle or organic from inorganic?

A. Yes B. No , if your answer is 'No', go to question No. 15

13. If your answer for question No. 12 is 'Yes', which of the following types of solid wastes do you separately store together? (You can choose more than one).

A. Used papers B. Used plastics C. Used glasses D. Used metals

E. Used clothes, leathers, and other similar wastes F. Food left over

G. Spoiled vegetables and animals shits H. specify others _____

14. If your answer for question No. 12 is 'Yes', why do you separate? (You can choose more than one).

A. To reuse C. To give for other users like ''Liwach''

B. To feeding domestic animals D. To use for fertilizer

E. To make fuel and use in the home like 'biogas'

F. To burn separately in the compound or at road side

G. To hand over to private waste collectors H. Specify others _____

15. If your answer for question No. 12 is 'No', why? Justify your reason _____

16. Have you interest to charge for private enterprise to get an access of solid waste collection service? A. Yes B. No

17. Do you know that private enterprise/private waste collectors exist in Jimma town?

A. Yes B. No C. I don't know

18. If your answer for question No. 17 is 'Yes', how they are performing their task currently? (You can choose more than one alternatives).

A. They are discharging their given responsibility and duty properly

B. They are carrying out their task arbitrary i.e not cover all the stated place/households

C. They are not serving at the right time and day

D. To some extent, they are discharging their duty and responsibility but not enough

E. Specify others _____

APPENDIX V

INTERVIEW QUESTIONS FOR MUNICIPALITY (Head of Municipality)

1. Do your department providing solid waste disposal services at household level? If Yes, what are the basic solid waste management services your department delivering at household level? If No, why?

2. Do you have facilities and equipments such as trucks, carts and public containers (near to HHs) to handle HHSW disposal practices in Jimma town? If Yes, is it enough to provide services? If No, why?

3. Are there a problem of HHSW disposal practices in Jimma town? If Yes, what are they?

4. Do the municipality have adequate human power and financial capacity to run the SWM in the town?

5. Where do you get the budget for solid waste management services? Is the budget you prepare per year well enough to handle solid waste disposal practices? If Yes, how much? If No, why?

6. Do the municipality have formulated legal binding towards SWM practice at household level? If yes, how it decide punishment on those who violate the laws and regulations?

7. What is the substantial effort taken by municipality/your dep't to manage solid waste effectively especially at household level?

8. Do you think that there is effective HHSWM practice in Jimma town currently? If No, why? Justify your reason.

9. Do the municipality formulate its own laws and regulations to handle solid waste disposal practices at household level in Jimma town? If yes, state the laws and regulations.

10. Have the municipality encourage greater private sector participation in solid waste management? If yes, how? Justify it.

11. Do your dep't/municipality ever provide short term training and education programs to initiate and facilitate private waste collectors to improve SWM? If yes, particularly on what training and education program is given?

12. Is your dep't/municipality teaches the society/households to create awareness on ways to manage solid wastes? If yes, in what way or how it delivers this teaching program to the public at large?

13. Are there regulated SW handlers particularly PWCs/PEs in Jimma town? If yes, how many are they?

14. How the municipality/your dep't follow-up the application of laws and regulations of SWM at house hold level?

APPENDIX VI

QUESTIONS PREPARED FOR FOCUS GROUP DISCUSSION (PWCs)

1. How long your enterprise has been worked?

2. Do you feel comfortable working in this sector? Why?

3. How does the enterprise treat and manage solid waste disposal currently and the condition of payment for the services?

4. What are the greatest difficulties you encounter working in this enterprise?

5. What do you intend in addressing this problem?